955-10.

A.P. GREEN

EMPIRE

The World's Finest First Quality Fire Brick

Making the NEW Press-Annealed Empire Dry Press Brick.

A. P. GREEN FIRE BRICK CO. MEXICO, MISSOURI, U.S.A.

Part of Battery of Eleven Dry Presses
for Making Empire Quality
Standard and Special Shapes.

Specifications 'Round the World read:

"A. P. Green Empire or Equal"

HAND MADE—
EMPIRE
SPECIAL SHAPES

DE-AIRED—
EMPIRE STIFF MUD

PRESS-ANNEALED—
EMPIRE
DRY PRESS

A. P. GREEN EMPIRE

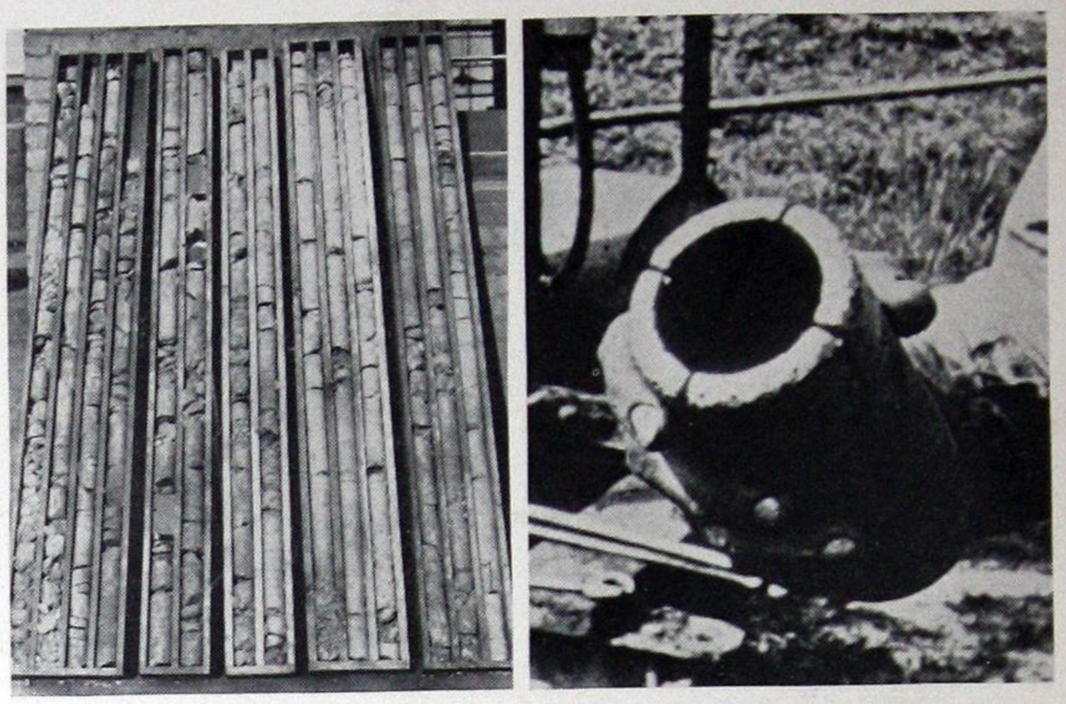
THE WORLD'S FINEST FIRST-QUALITY FIRE BRICK

YES, SIR, I'll be glad to show you why EMPIRES are the world's finest first-quality fire brick. My car is just outside. We'll drive out to the clay pits first. On the way I can tell you something about Missouri clay, and how we control its selection years in advance.

To begin with, the clays in Audrain County — that's this county — and a few near-by counties, are the finest in the country. They are a little higher in temperature resistance—a little lower in impurities—and a lot more abundant. Nature was very generous with her fire clay deposits here, and the EMPIRE clay in the A. P. Green pits is noted for its excellent chemical and physical properties.

When we started making fire brick back in 1910 the same clay was used then in making our high-grade brick—EMPIRE. The quality of that clay has not changed. It's just as good as ever—and the fact that about a billion EMPIRES have gone into service in every country in the world pretty well proves their superiority. Manufacturing, however, has changed, and during our trip through the plant you'll see the scores of improvements and refinements in processing methods, machinery, and manufacturing that make EMPIRE the world's finest first-quality fire brick.

Let's get out here and go into this little office. It overlooks the pit and is the office of a ceramic engineer. Here, stand by this window. You see out there one of the largest open-air, high-grade fire clay pits in the



At the left is a core box holding 40 feet of clay samples just as they were taken from a prospect hole. Right — Diamond edged core drill.

world. Exposed at the present time is at least two-years' supply of clay, with four or five years' yet to be mined. Beyond that a new pit with at least ten-years' supply, and out there acres and acres of other deposits prospected but still untouched.

In locating these deposits, engineers can tell pretty accurately by the contour of the ground and geological formation just about what the underground deposits will be. First, tests are made by sinking borings at random, using diamond-edged core drills. The land is then mapped out and borings sunk on 50- and 100-foot centers—and the core samples put through scientific laboratory tests to determine drying and burning shrinkage, fusion point, and reheat behavior. Made well in advance of actual mining, core drillings enable our engineers to know just where each kind of clay is located and its properties.

But let's look at this pit again. Across the top there you see what we would call "overburden"; first, soil

955-10.

Showing samples of clay and burned test bars on the engineer's table at the pit. The pit can be seen through the window.

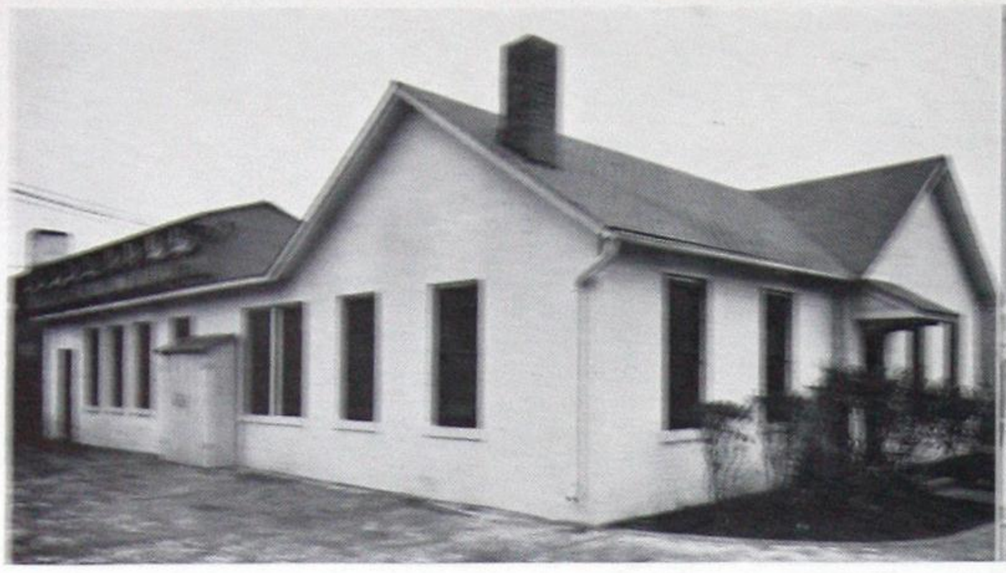
deposits and, second, rocks, occasional thin beds of coal, and other deposits. The large shovel at the right is loading overburden which it is stripping from the top of the clay. Those two shovels near the center are picking up fire clay from two different "faces." The cars right down here are loaded with clay to be transported to the plant. You see, clay grades in a deposit overlay one another so, as needed, the clay is mined and loaded, and each car tagged, so that the men at the crusher house will know into which hopper the clay goes.

Here on this half-circular engineer's table in front of us you see clay samples laid out with burned test bars at each pile. Now it's significant that these samples in their order here approximate the same order in

Ceramic engineer taking sample from the face of clay diggings for laboratory tests.

which clay is found out there in the pit. In other words, the clay sample here at the right is exactly like the clay out there at the right of the pit, and so on around the exposed clay faces that you can see. The burned test bars are actually samples previously taken on 25-foot centers along the face of the pit itself. This is another feature of our rigid system of control over the selection and quality of raw material. The engineer in charge here knows exactly just what types of clay are available out there, and because of prospecting

Panorama of one of A. P. Green clay pits—the largest open-air high-grade fire clay pit in the world.



New home of the A. P. Green Laboratory.

Left — Engineer in laboratory checking grain sizing. Right — Measuring Empire brick, after re-heat test. Machine in foreground used for testing modulus of rupture of full size brick. At rear — Same test on Empire clay test bars.

tests, and pit tests made by the laboratory, he knows exactly their grades and physical characteristics.

It may seem to you that we go to a lot of trouble at this stage of producing EMPIRES. We do. But, to us a brick is no better than the raw clay which goes into it, and much of the success of EMPIRES, and of all A. P. Green products for that matter, has come to us because we demand and get the finest clay available anywhere in the world, and because we maintain relentless control over its selection and processing. Nothing stands still at the Green plant. No process is so good that we don't try to improve it. No piece of laboratory or plant equipment is so satisfactory that we don't search for newer and better. As I said on the way down here, nature has generously supplied us with a wealth of remarkable clay. We don't take credit for that, but we do take credit for recognizing its value and for consistently making it into better brick .... I think we can go back now and, starting at the crusher house, see some of the things we've done to make EMPIRE Dry Press, Stiff Mud, and Hand-Made Brick outstanding.

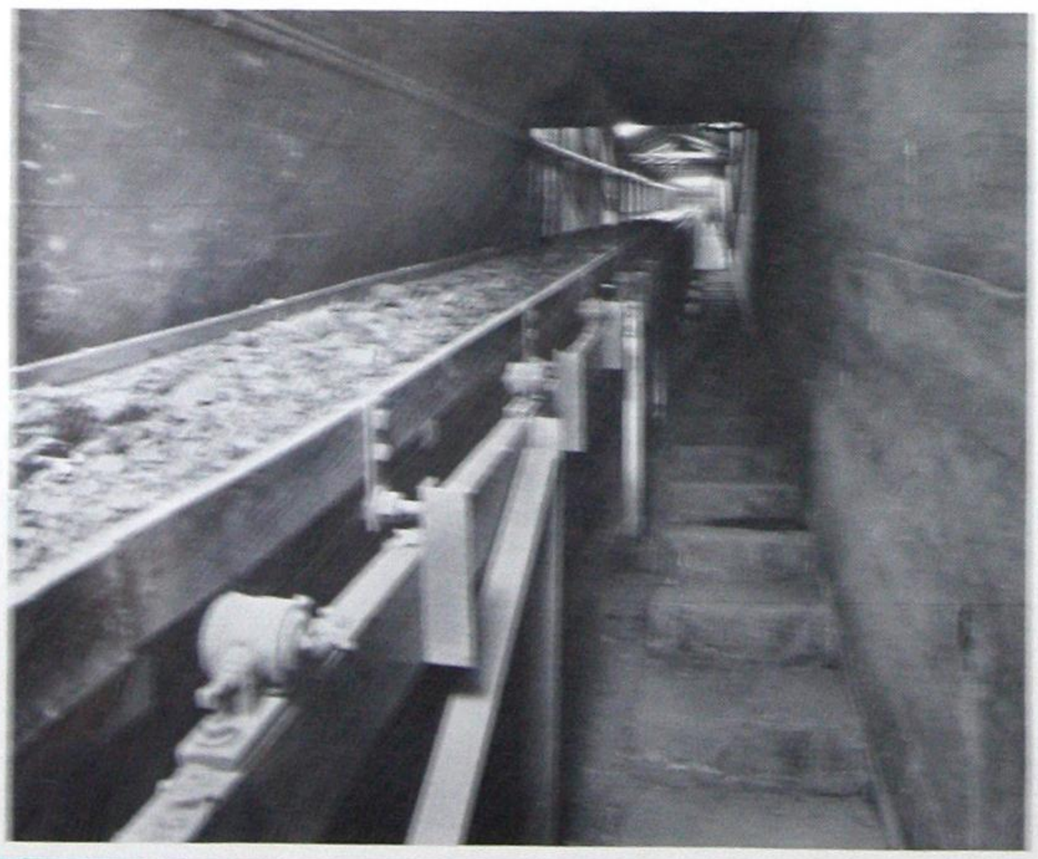
A. P. GREEN DRY PRESS

EMPIRES

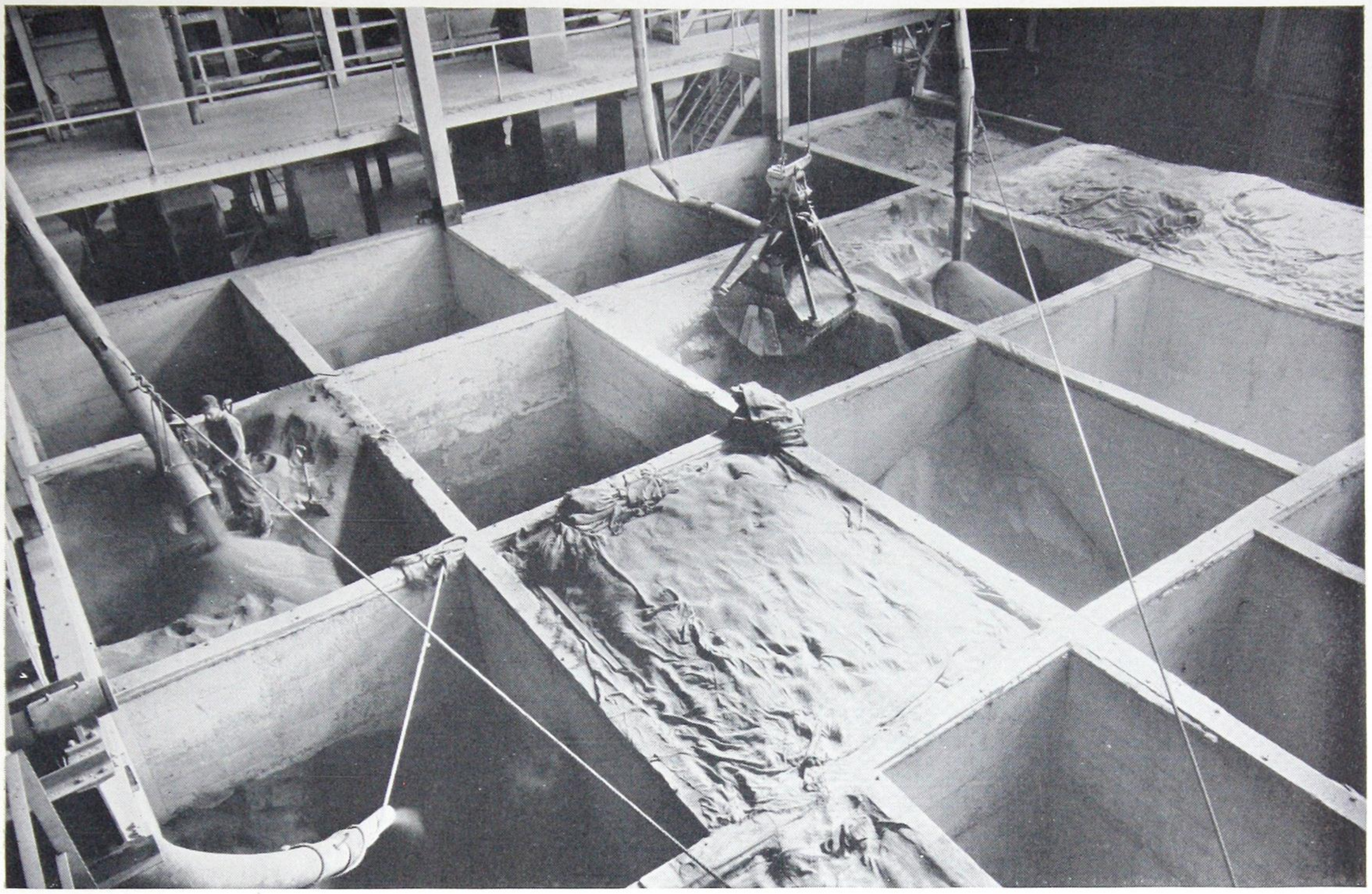
(PRESS ANNEALED)

HERE we are at the crusher house. Remember those cars loaded with clay and tagged down at the pit? Well, right here is where they're dumped. Let's go down inside. When the clay is unloaded and recorded as to its type, it is crushed to a goose-egg size, and at a buzzer signal from above goes up into the plant on this conveyor belt, and is dumped into bins according to its tag classification. We'll climb up here along the conveyor and come out at about the top of the plant. And here's a rather interesting thing. This conveyor belt gets terrific wear, and is the longest continuous steel belt in the world in this kind of service. It is an unusually high-grade steel, with high tensile strength to withstand

Here you see raw clay moving into the plant from the crusher house on a steel conveyor belt.



Shows complete self-contained model brick plant within the laboratory, used for experimental and testing work.



Huge clay storage bins with clay being fed into three of the bins. Note burlap covering over bins used to temper the clay. The 80-foot electric overhead crane can also be seen lifting a bucket full of clay.

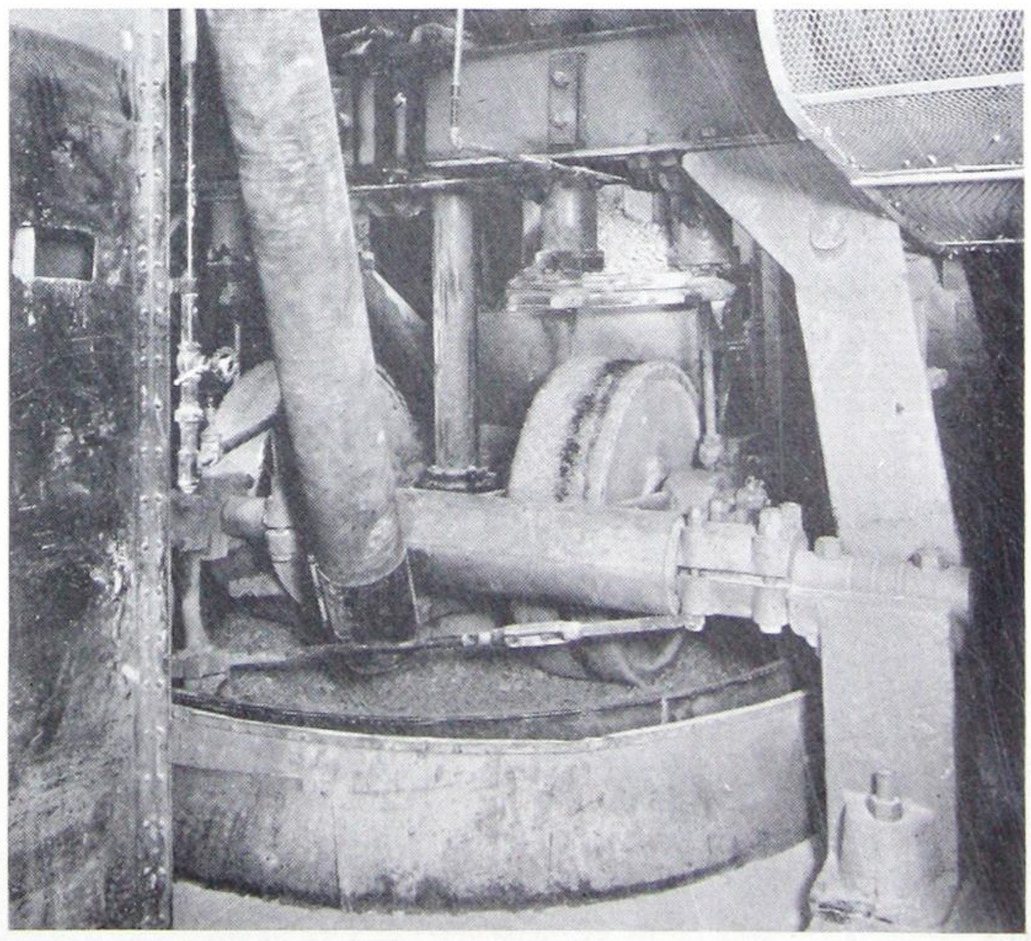
the wear of carrying clay and the constant flexing over the end pulleys.

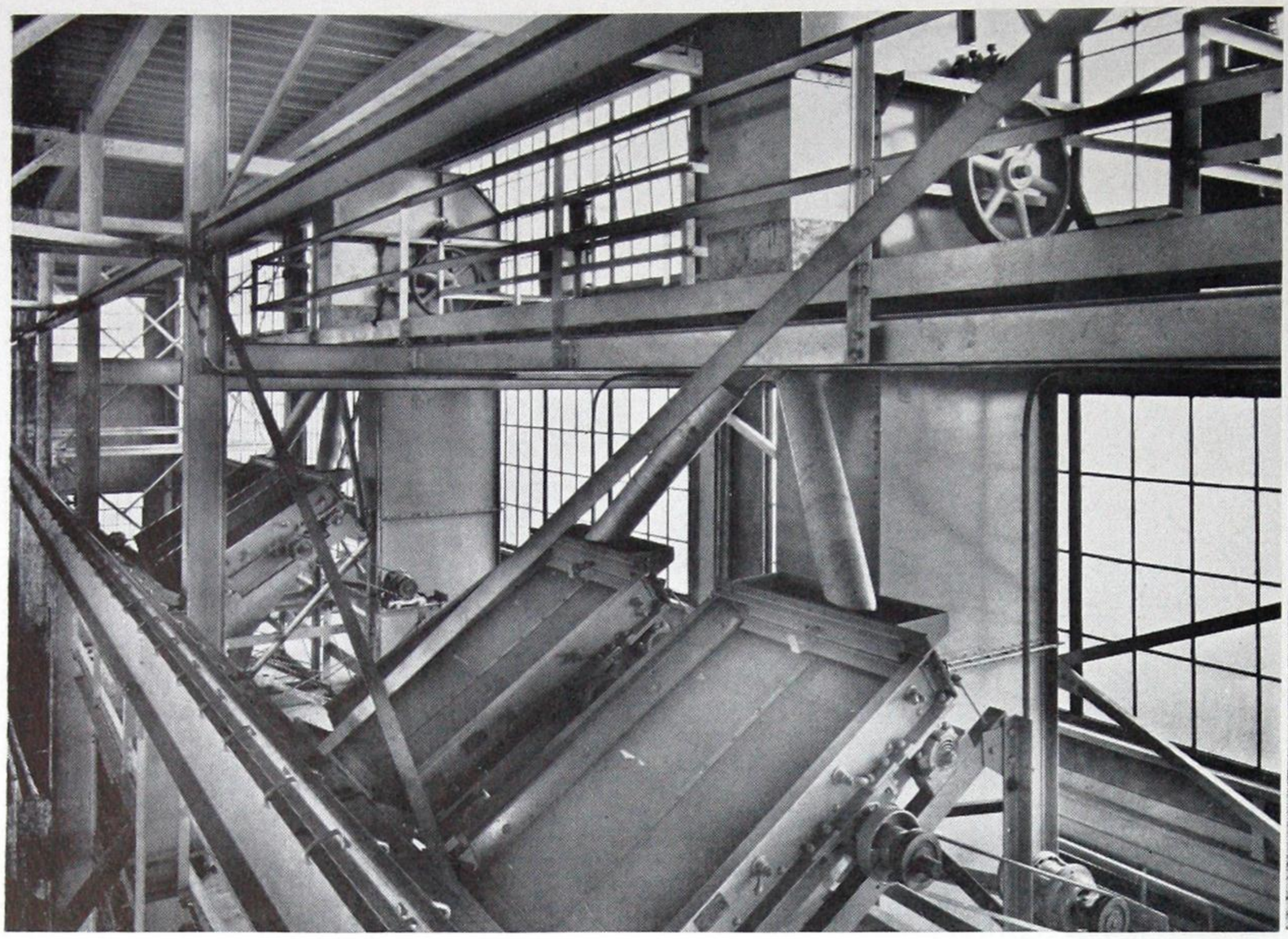
Now look over here. The clay is fed off the conveyor belt into those bins down there, which in turn feed it into the dry (grinding) pans. If you'll come over here by this rail you can see the bins better. Each one holds 90 tons of clay and is that large because large supplies of clay are needed inside to balance weather conditions. A lot of plants leave clay supplies outside, but during the rainy seasons, or in winter when snows are heavy, the moisture content of the clay would be too great, or under a blazing sun the clay would dry out too much. So, since the amount of moisture present in clay is of great importance, all clay here is allowed to assume room temperature. With this great storage under cover we can discontinue mining when weather is unfavorable.

Now look down there to the left. You can see the ground clay being fed into two of the "aging" bins. Over at the right another bin is being filled, and next to it our huge 80-foot electric crane is picking up a bucket full of tempered clay. By the way, that's the only overhead crane of its kind in operation in any fire brick plant.

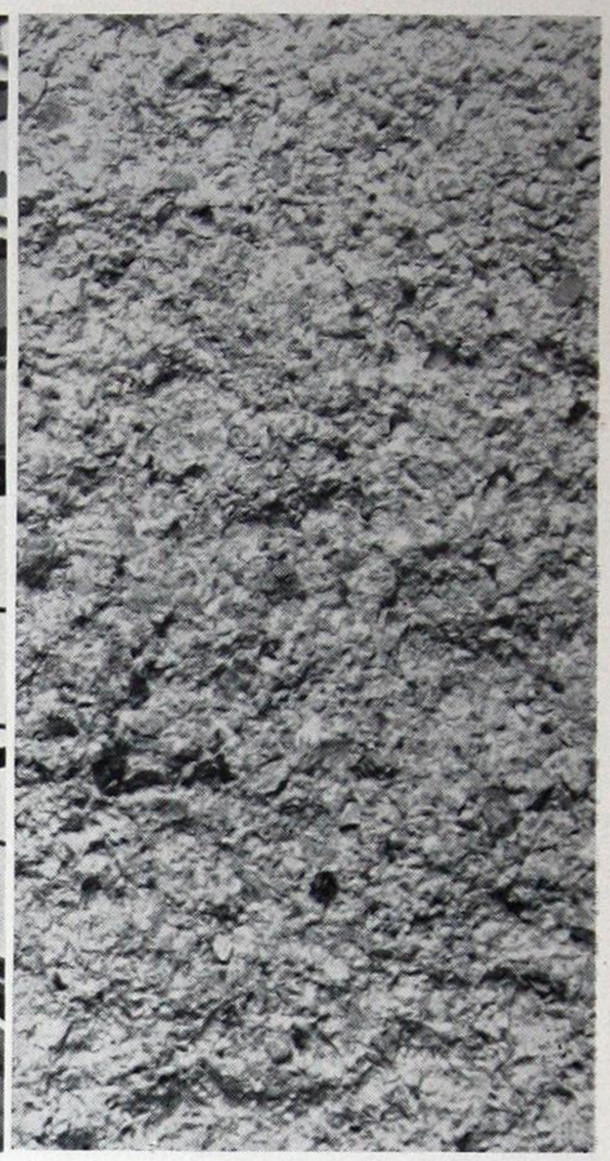
Now I said that the clay goes first to the dry pan. There it's crushed to the required size, and then elevated to screens back up here. This, then, is our logical starting point, because for the three types of EMPIRE

Here is one of the dry pans, pneumatically operated. Left — is the bucket conveyor for elevating clay to the vibrating screens above.





Here are the vibrating screens—only the correct grain sizes necessary for Empires pass through these screens and on to the bins.



Close-up view of the texture of Press-Annealed Dry Press Empire. Dry Press Empires excel in spalling resistance and yet are dense enough to be suitable for many slag conditions.

Brick — Dry Press, Stiff Mud, and Hand-Made — the treatment is all the same up to here, but from here on each of the three processes is different.

Suppose we follow through on EMPIRE Dry Press first. Over here on this side are the continuous vibrating screens. As I told you, the ground clay is elevated to these machines where it flows over the screen, and if the clay is the right mesh it drops through. If it's too coarse, it then returns to the dry pan for further crushing. You can see the dry pans in operation right down there. All of these screens you see vary in mesh openings so that various sizes of clay can be had—that is, grain sizes. In this way, by controlling the fineness or coarseness of the clay grind, grain size is under absolute control.

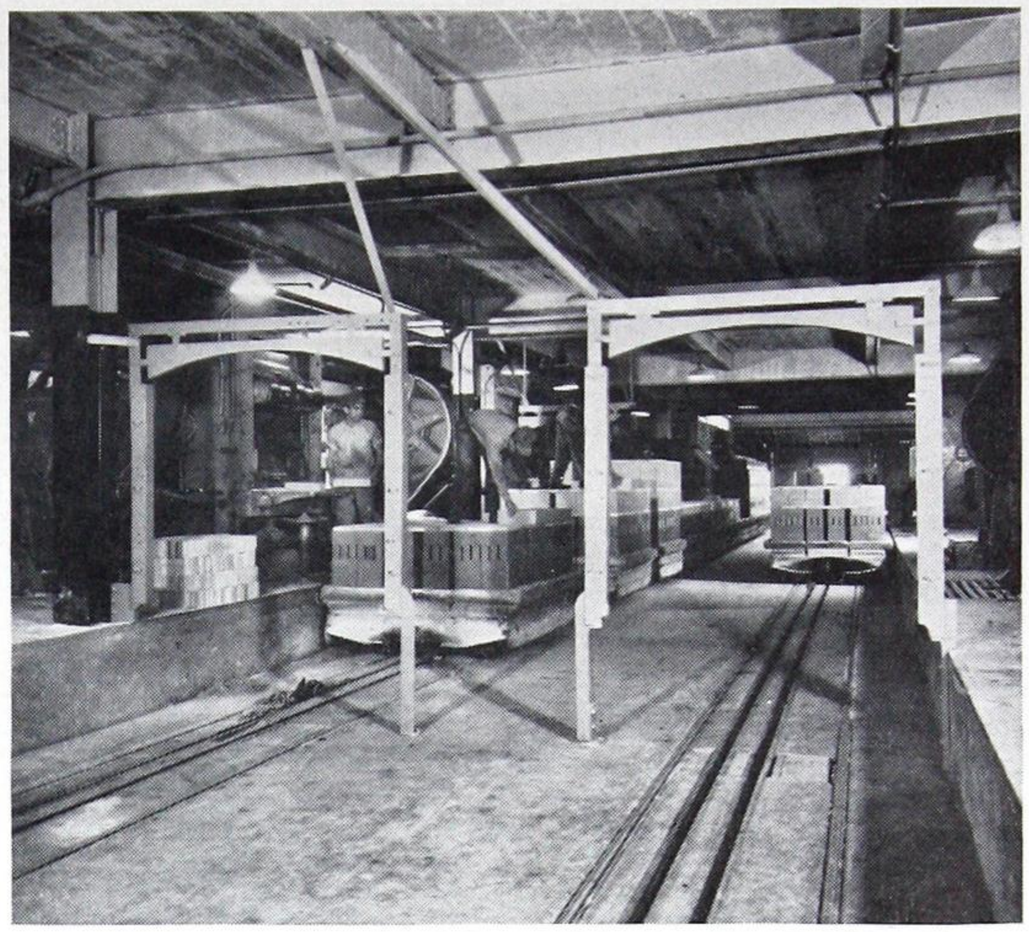
From the screens, the clay is next carried through those tubes there into the storage bins below, where it is carefully spread to prevent segregation of particles. When the bin is filled it is covered with burlap such as you see, and the clay is allowed to temper from 24 to 48 hours before using, thus equalizing the moisture content throughout the entire mass. Then, as I pointed out to you a while ago, the clay is picked up by our overhead crane and dropped into quadruple bins and from there fed into a mixer which makes an even more intimate mixture of coarse and fine particles. All of this procedure is a vast improvement over old methods. At one time clay was fed direct from dry pans to bins over the dry presses. There was no aging and no proper control of moisture. As a matter of fact, moisture content was just a guess. Now we control moisture, and age the clay accurately. You see, aging raw clay increases its plasticity and working properties. The Chinese had it worked out in their own way. They used a non-plastic clay, Kaolin. One generation mined and stored the clay for aging—the second generation coming after used it. We take these steps scientifically and systematically to improve the quality of EMPIRES.

If you'll come down these steps here we can see close-up the dry pan you were looking at from above. Those tremendous rollers turn constantly, and compressed air chambers on the wheels can be adjusted to control the size of clay particles, which are further controlled by the size openings in the screens we looked at before. Here again we maintain definite control of the percentage of clays fed into the dry press. Raw clays from the crusher house have certain known fixed characteristics. Here is where the percentage of each is fed in according to formula. Grog (crushed burned fire brick) or calcined raw clay is fed from separate bins in predetermined amounts and incorporated into the mix when needed, and here, too, a small amount of water is added.

I can't say too much about the importance of controlling moisture in the clay mix, since it has a tremendous influence upon the physical properties of the brick. Not enough moisture and the brick will fall apart—too much and difficulties are encountered in forming, drying, and burning. As I said, under old methods of manufacture,

moisture content was just a guess. Then came scientific laboratory tests, and we've even improved on that. Instead of taking samples up to the laboratory for testing and having a bin fill up while the test was being made and likely having too much or too little moisture, we now make a moisture-content test right here in the plant in less than five minutes. So you see nothing gets out from under our fingers for any length of time. Another reason for the splendid quality of EMPIRES.

Now we can move over here to the dry presses. Remember, our clay feeds from the mixer into the dry press hoppers and as it goes into the press itself, dies from top and bottom exert equal pressure to form the brick. Here an unusual process is introduced and I want you to understand it thoroughly. The closer the seating or packing of the clay particles one with the other, the denser and tougher the brick will be. *So to carry this to the ultimate point we have introduced the de-airing, press-annealing process which provides one ton of pressure per square inch of surface.* Under this tremendous pressure, air is forced out of the clay, making a dense, tough brick, highly resistant to slag and abrasion. At the same time all particles in the clay are annealed together, thus eliminating all strains set up in the brick during the pressing operation and making it unusually resistant to spalling. Each dry press has a variable speed control device on it which slows or speeds up the motion of the dies coming together, according to the type of brick or shape being made. Here, too, is produced a great variety of unusual dry press EMPIRE

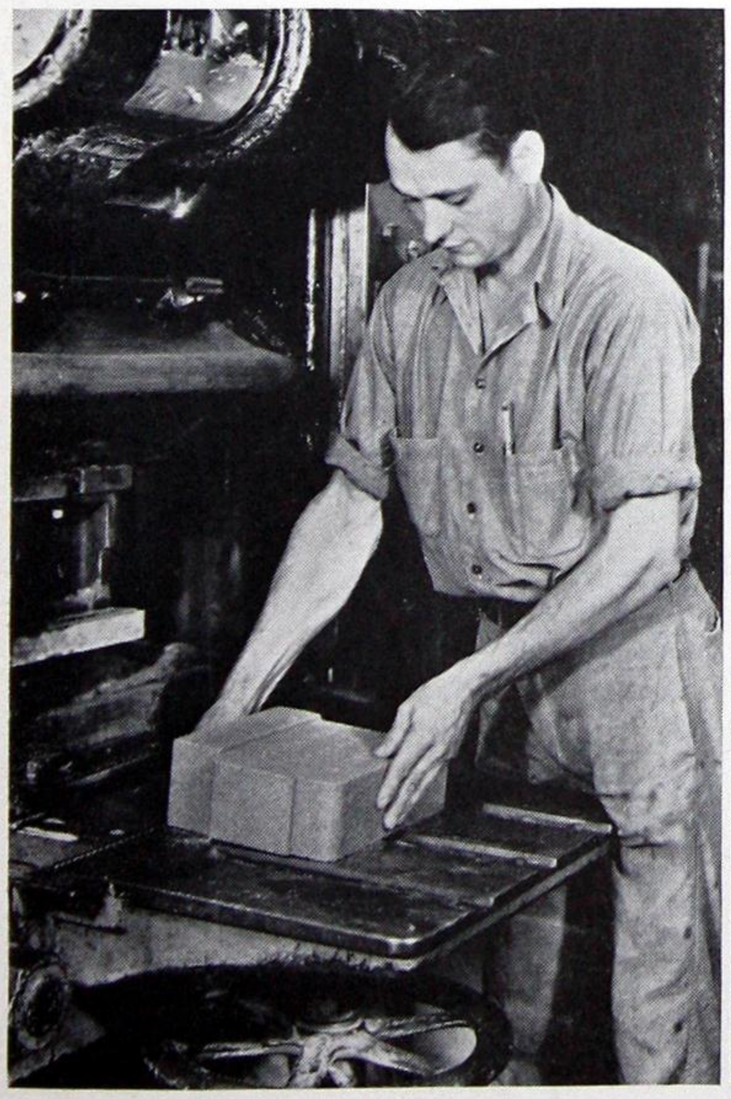


Battery of Dry Presses. Part of the largest lay-out of dry press equipment in the United States needed to meet the demand for Press-Annealed Empires and other dry pressed A. P. Green products.

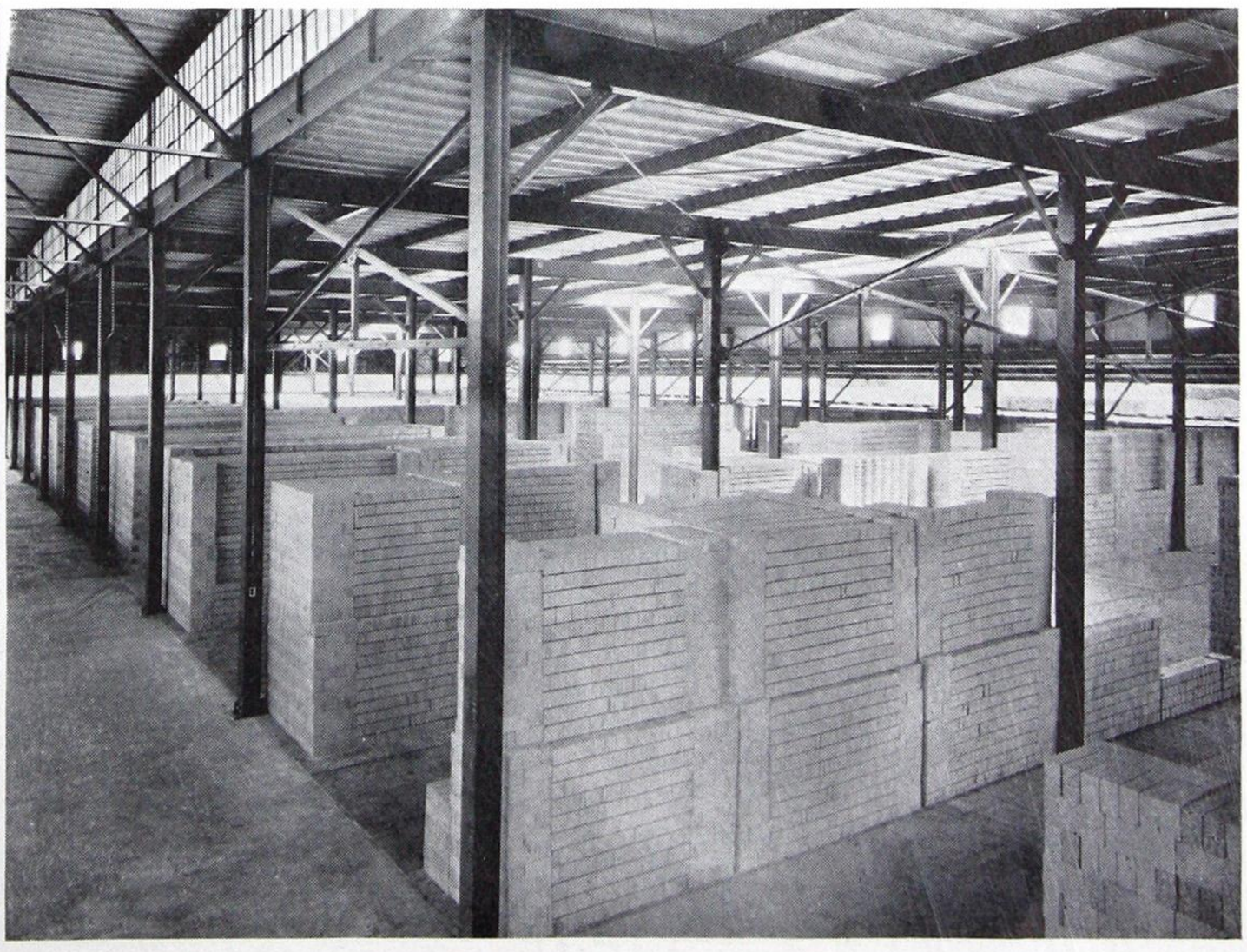
shapes as well as standard brick, all de-aired and press-annealed, and, as you can see, each brick, each shape is uniform to a remarkable degree of accuracy.

Then, too, very little handling is necessary, as these brick are loaded on tunnel kiln cars right from the press and not touched again until they are loaded for shipment to your plant. And now we'll leave the Dry Press EMPIRES on the car ready for drying and burning, and look at the Stiff Mud process of producing EMPIRES.

"Off-bearer" removing a special Empire shape from the dry press.



A stock shed of the most advanced fire brick plant in the world — where Empire brick are kept.

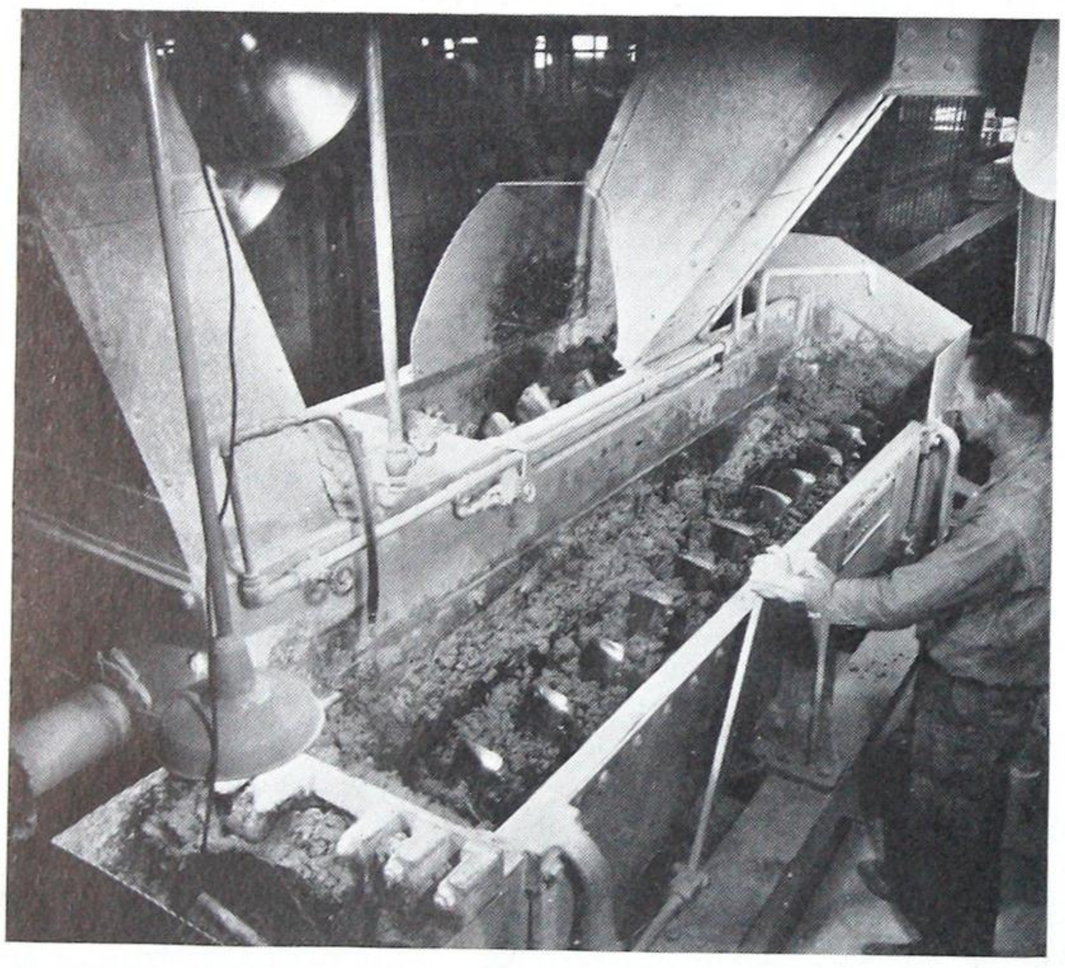


A. P. GREEN STIFF MUD

EMPIRES

(DE-AIRED)

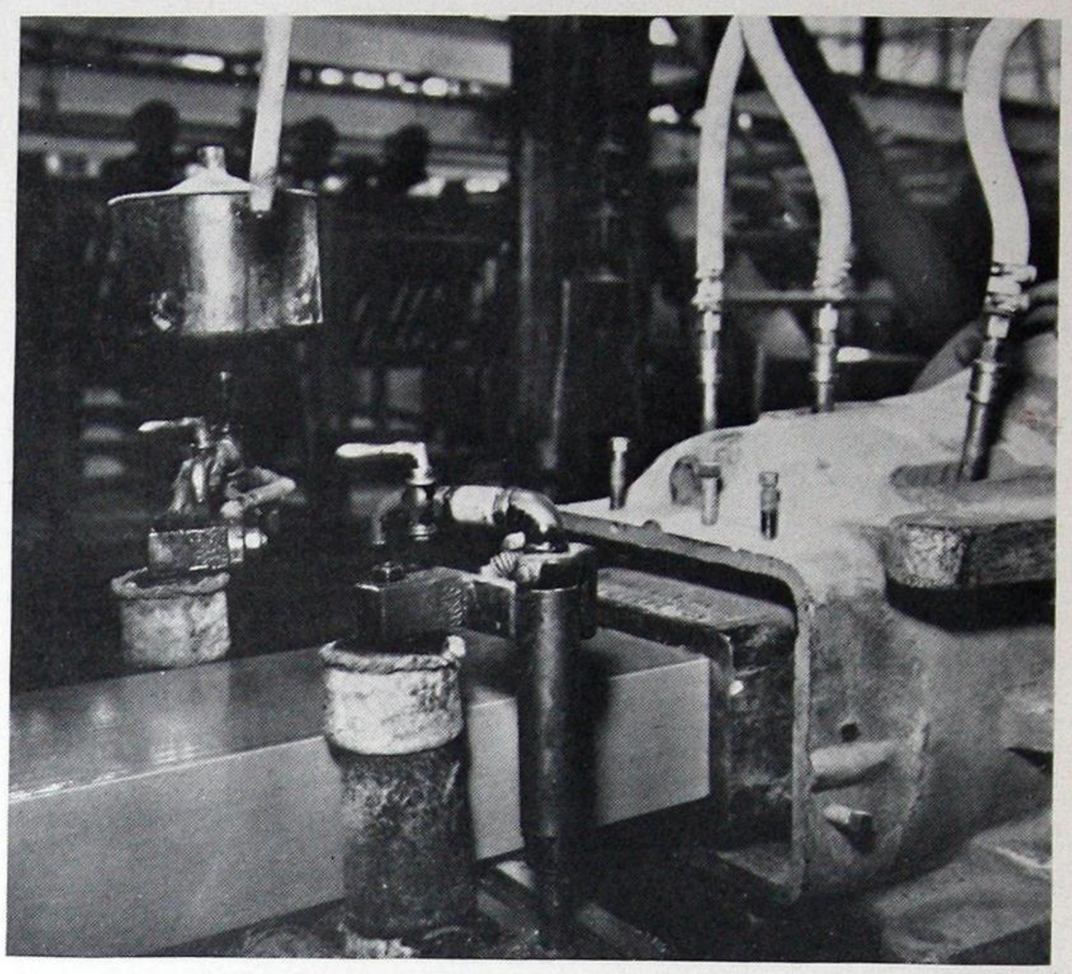
HERE we are back at the dry pans, because it is here that we pick up the Stiff Mud process. As before, the clay is delivered into the dry pan but without moisture being added in the grinding and, as before, the ground clay is elevated to the screening section. From there it goes into parabolic sectional bins. Each section in these bins may contain a different clay or grog as determined by the laboratory. This is so because our laboratory technicians, working here in one of the most complete refractory laboratories in the country, have learned by test and experiment that the blending of certain clays will produce a certain kind of brick, and here is a most interesting and important feature.



The Stiff Mud Double Pugging equipment in action.

By the use of equipment created and designed by us, we control the speed of delivery of clay onto the belt feeding into the pug-mill and, as shown by this indicator control lever, we maintain within 1% the theoretical mix established by the laboratory. An inspection of the mix is made here every half hour so that there is no deviation from laboratory requirements.

Over here is one of the most modern designs in mud machinery operating in America today. It is our double action pug-mill. You can see the clay coming off the end of the belt. It drops into the mill, is pugged and partially tempered and then these knives, set at an angle, churn and force the clay through the mill and into the augur machine for further tempering. If you'll come around here I'll show you a very interesting process, one which adds a great deal to the quality of Stiff

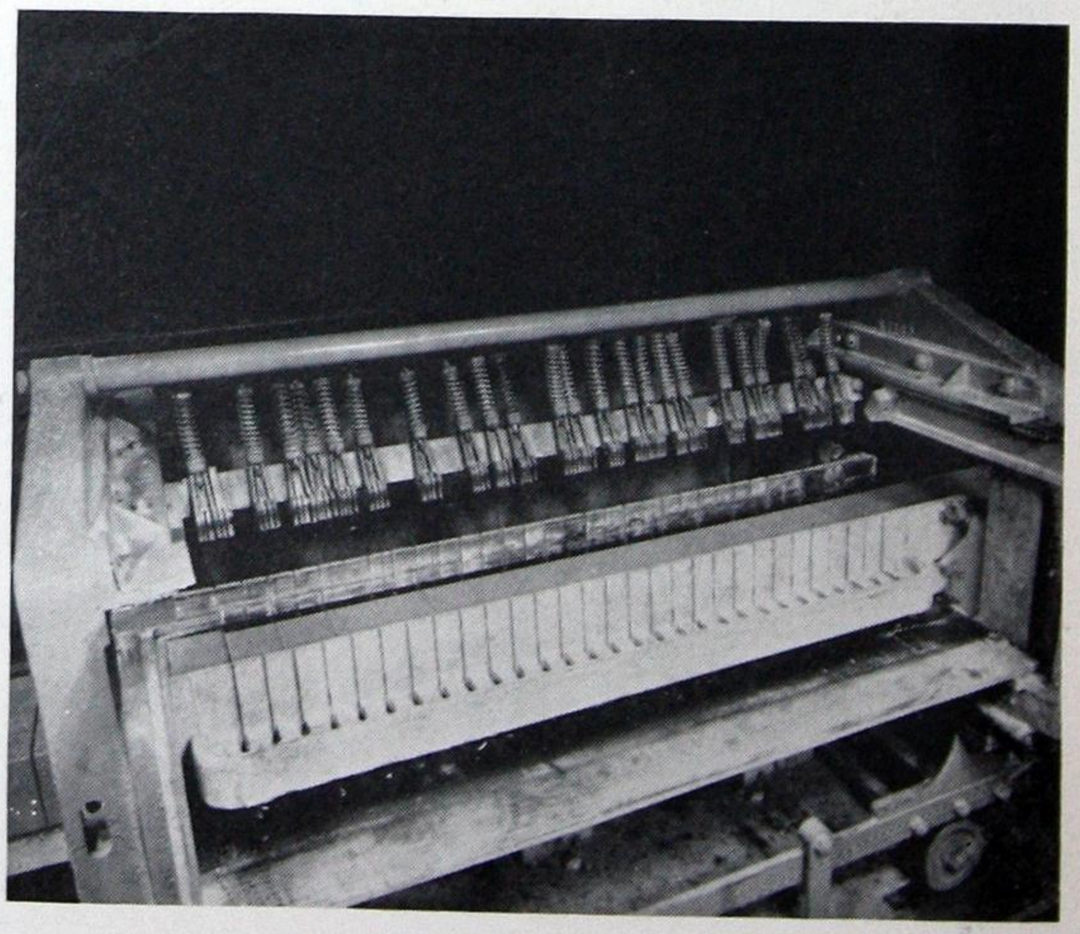


Column of stiff mud extruded from the die of the augur machine after it has been de-aired.

Mud EMPIRES. That's de-airing. As the clay moves along through the augur machine it passes through this sealed chamber in which a vacuum is maintained. The indicator there at the top registers the amount of vacuum, and the action of this chamber is to suck out all of the air from the clay; air which is naturally in the clay mass, and which is entrapped in the long clay column by the pressure caused in passing through the die. This de-airing process increases the plasticity of the brick, prevents laminations and hollow cores and centers, and gives a better bond.

Passing the de-airing chamber, the clay is then extruded through another die under tremendous pressure—moves along an oil film also under tremendous pressure, and

Wire cutters, slicing through stiff mud bar to form Stiff Mud Empires. This cutter travels along with the column as it makes the cut.

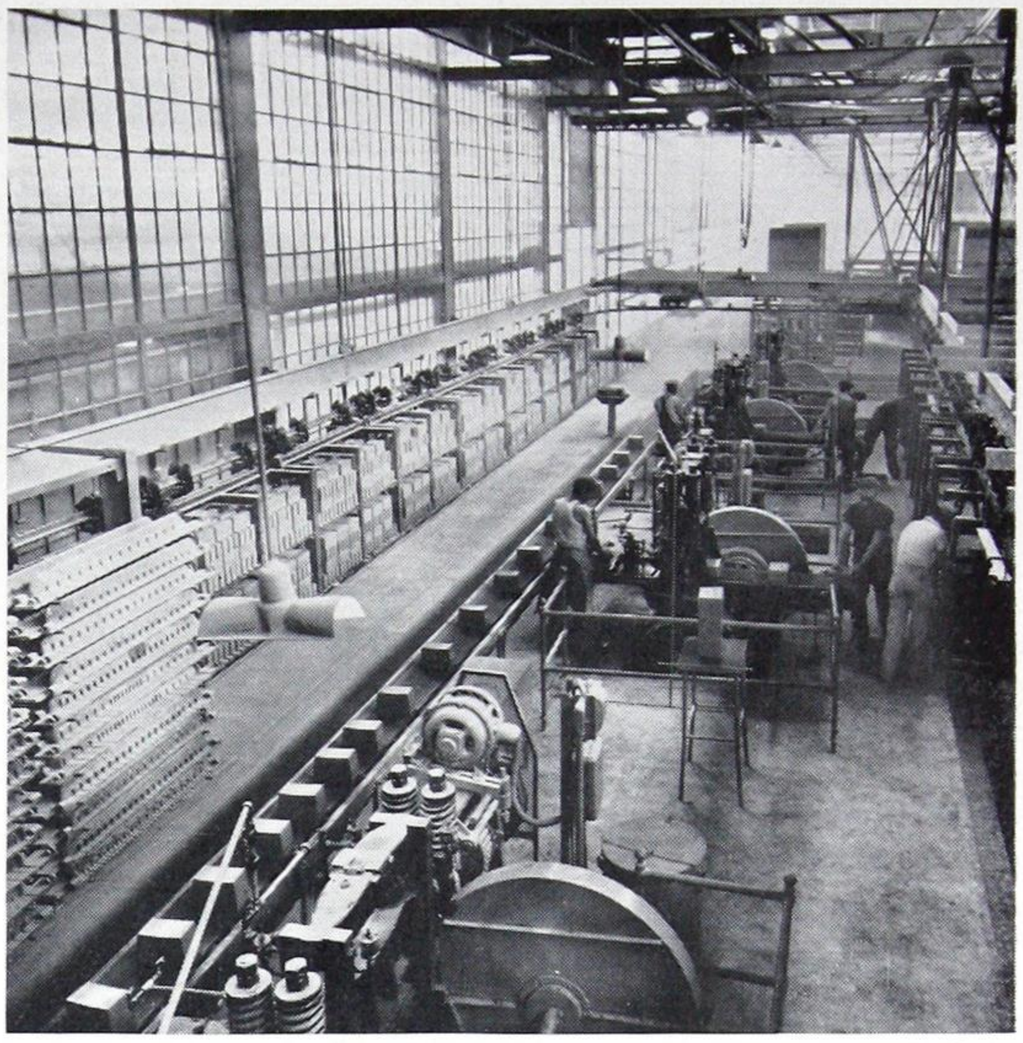


A. P. GREEN EMPIRE

comes out of the mouth of the die in a solid column over oiled rollers and onto the cutting machine. Now step down this way and watch the cutting machine in action. At the back there is the solid steel bar through which the cutting wires pass. These wires can be adjusted to exactly the width of the brick to be made. The other dimensions are controlled by the die. As this column of stiff clay moves along, the cutting wires move in the same direction at the same speed. There, see the wires come through? A straight, true cut every time.

Down here you see the "dobies" or rough brick coming on to a moving belt which is traveling at a greater speed than the one moving through the cutter. This increased speed, as you can see, separates one "dobie" from the other by several inches, so as they come on down to the battery of represses they can be picked up by hand and placed in the repress. Here absolute uniformity comes into the picture again, because the represses are used to true up the brick, making its corners and edges square and sharp and to stamp in the brand "A. P. Green EMPIRE S. M." All brick not absolutely uniform are rejected at this point. Because of the type of monorail cars used to carry the brick into the dryers, quick inspection and rejection is possible.

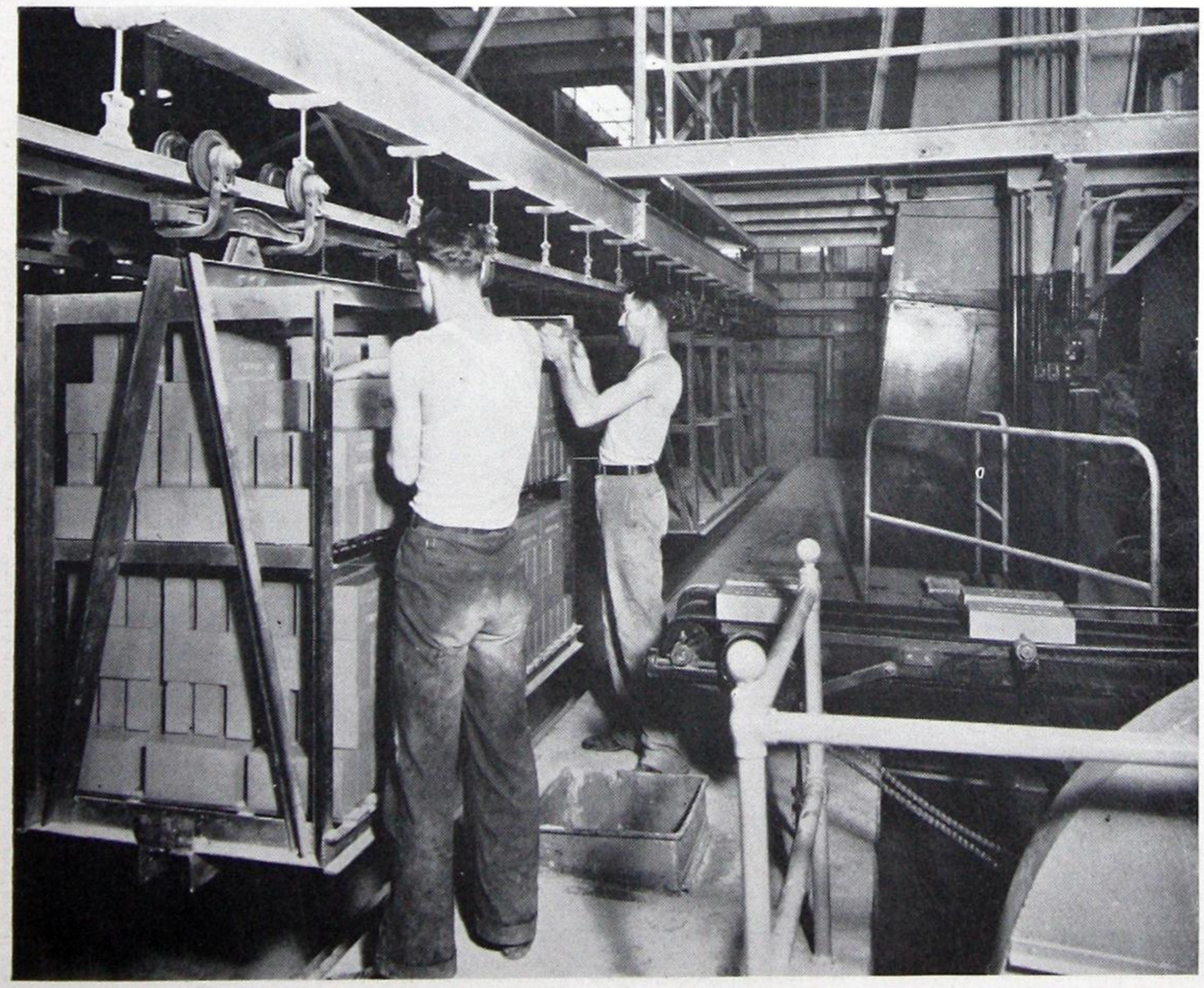
I'll have more to say about our humidity dryers when we come back to them from the Hand-Made section, but this system of scientifically removing moisture from brick is entirely different from methods used by most other manufacturers. We credit humidity drying with a great part in the international success of EMPIRES.



The repress line—"Dobies" or rough Empire brick move along on a continuous belt to the represses.

Now, after the Stiff Mud EMPIRES move through this humidity dryer, taking 24 hours or more to complete the operation, the overhead cars are pushed alongside tunnel kiln cars and the brick transferred to these cars. And so now we find Stiff Mud EMPIRES at the same point where we left Dry Press EMPIRES. And now to the third process — hand molding.

Empire Stiff Mud Brick being set on overhead monorail cars for transportation through humidity dryers.



De-aired Empire Stiff Mud texture. De-aired Stiff Mud Empires are very dense, and well adapted for bad slag and abrasive conditions.

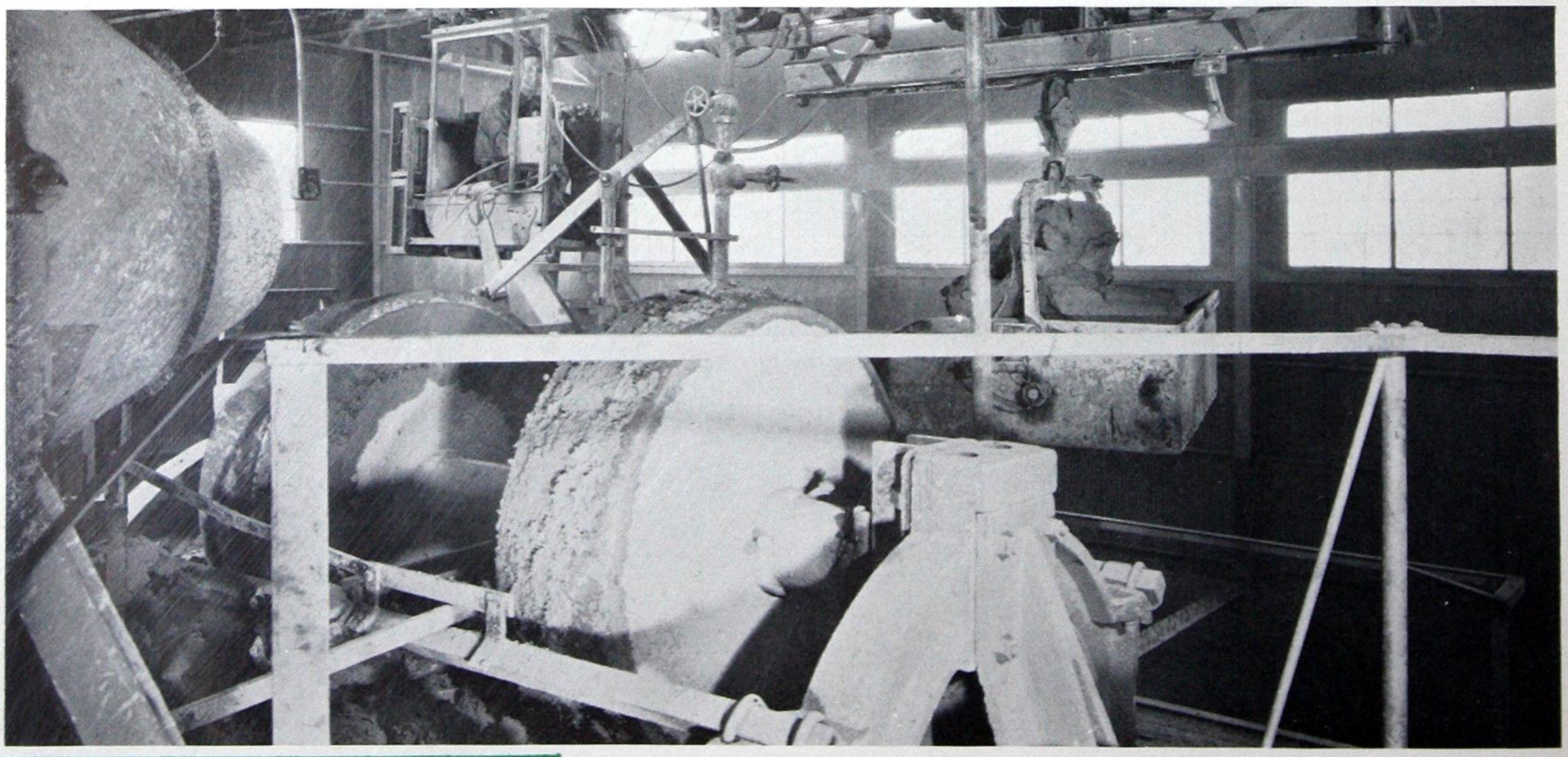
Workmen manufacturing Empire special shapes—you have to know how.

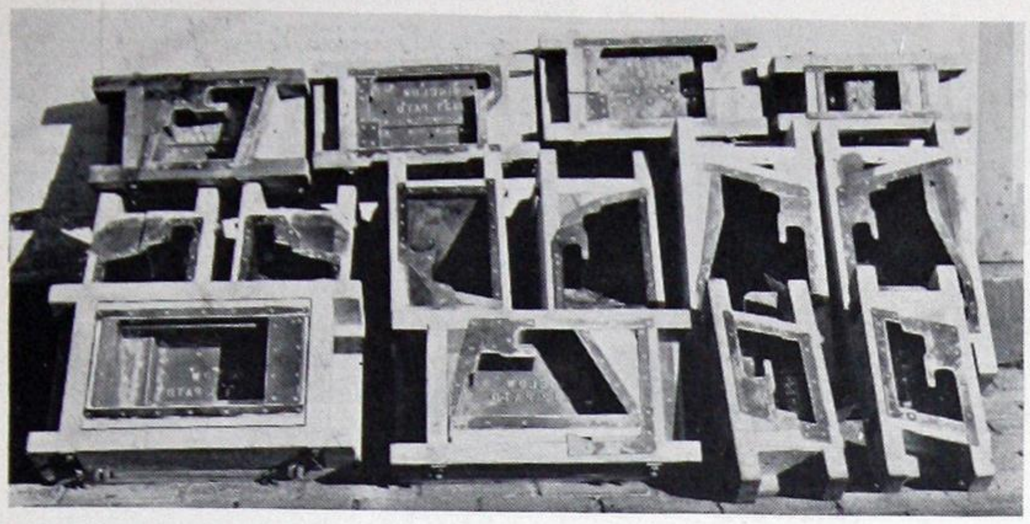
A. P. GREEN HAND-MADE
EMPIRES
(WOOD MOLD)

UNTIL now the processes, Dry Press and Stiff Mud, have been for the most part mechanical. True, highly trained technicians and scientists maintain constant contact and control over these processes at scores of strategic points, but craftsmanship, individual skill, and pride in the job find their greatest expression on the molding floor, which, by the way, is most unique and unusual so far as fire brick manufacturing is concerned. Thousands of different EMPIRE shapes are made here, because the accuracy, uniformity, and quality of EMPIRE Hand-Made tile ranks us well at the top in this field. But let's get back to the starting point. Here again the clays for Hand-Made tile, or so-called "Special Shapes," are received into the dry pans and ground dry, with no moisture added. Each type of clay is then dumped into another group of bins and kept separate, one from the other. This is done because there are so many more clays used in making the hundreds of mixes necessary for different kinds of tile. From these bins, then, the clay is transferred to overhead bins, and from these, whatever clay is designated by the laboratory for use in a particular mix, is fed into a mix car. Look at this mix car closely. You can see that the slides can be changed from one groove to another so that a great number of different sizes of compartments is possible. Now Hand-Made tile mixes are so different and varied in clays, grain sizes, and formulae that extreme care must be taken to avoid deviations from the prescribed mixes. Each clay to be used flows from bin chutes into its own compartment in the mix car in exactly the correct quantity, as I said, according to formula. These various formulae are prescribed for the service for which the shapes are intended.

Now the clays are dropped into a dry mixer and thoroughly blended to create a true homogeneous mass. The mix is then dumped into the wet pan and thoroughly tempered and pugged to increase its plasticity. Then this scientifically combined, carefully tempered "mud" is conveyed on an electric monorail overhead car to bins at each molder's table. Here the clay is kept

Wet pan, where clays for Hand-Made Empire are mixed. In the background is the monorail car loaded with clay to be transported to supply bins back of molder's table.





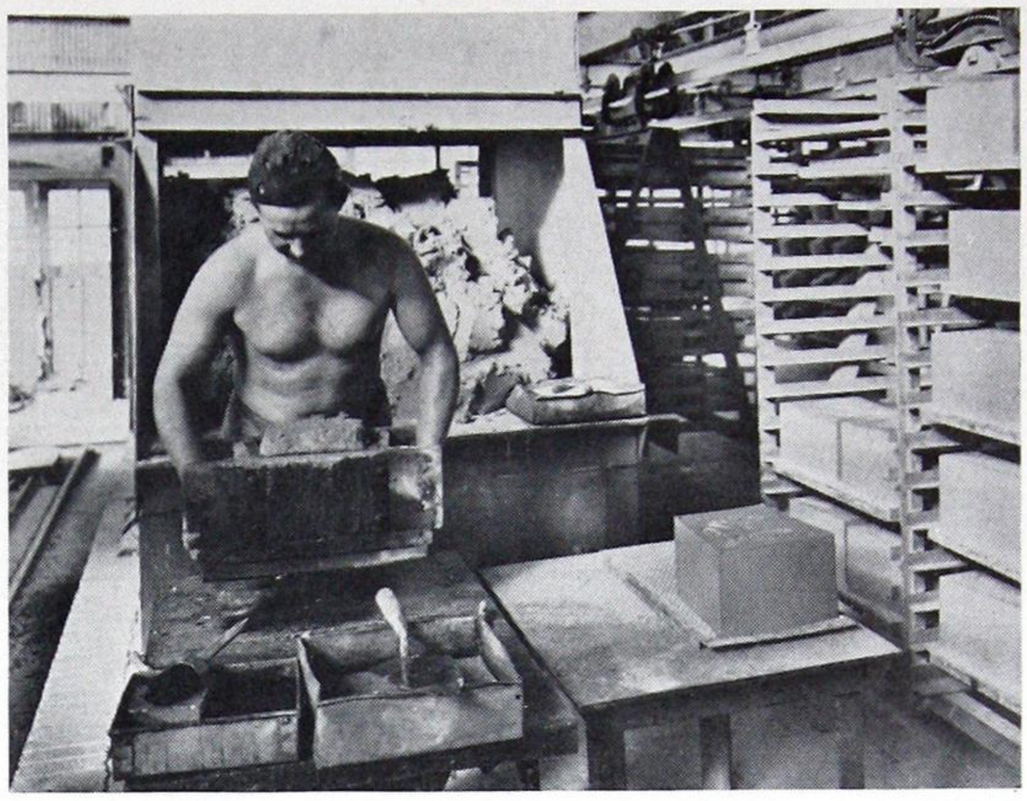
Molds used to produce Hand-Made Empire tile — wood molds and steel-lined molds all made to turn out perfect shapes.

covered and is delivered to the molder only in small masses, just enough each time to keep ahead of the molder so that the clay will not dry out.

And here we are on the molding floor. Let's watch this fellow. Look at those muscles. See how he breaks off just about the right amount of mud from his supply bin, forms it into a ball comforming roughly to the size of the shape to be made, then slams it into the mold. Now he picks up the entire mold and jogs it rapidly against the table. "Hand bumping" is the term, and this is done to settle the clay and fill the mold completely. Now you can see he smooths the top with a trowel, removes the mold, and there you have a perfect shape, scientifically controlled from way out there at the pit right down to this point, accurate in every dimension, uniform in every degree. Of course, it isn't as easy as it sounds or looks. Most of these men have been learning the "tricks of the trade" on our molding floor for ten or twelve years, and every shape presents a new problem.

Come here and look at the face of this tile. You see the tile numbers, the name "A. P. Green Fire Brick Company" and something else. It's the name of the molder himself stamped in. It's his tile. He made it, and every molder on this floor is just as proud of his name on that tile as we are of the name "Green" alongside it. It's a sort of old-fashioned idea with us, which, as you know,

Close-up of Hand-Made Empire texture.

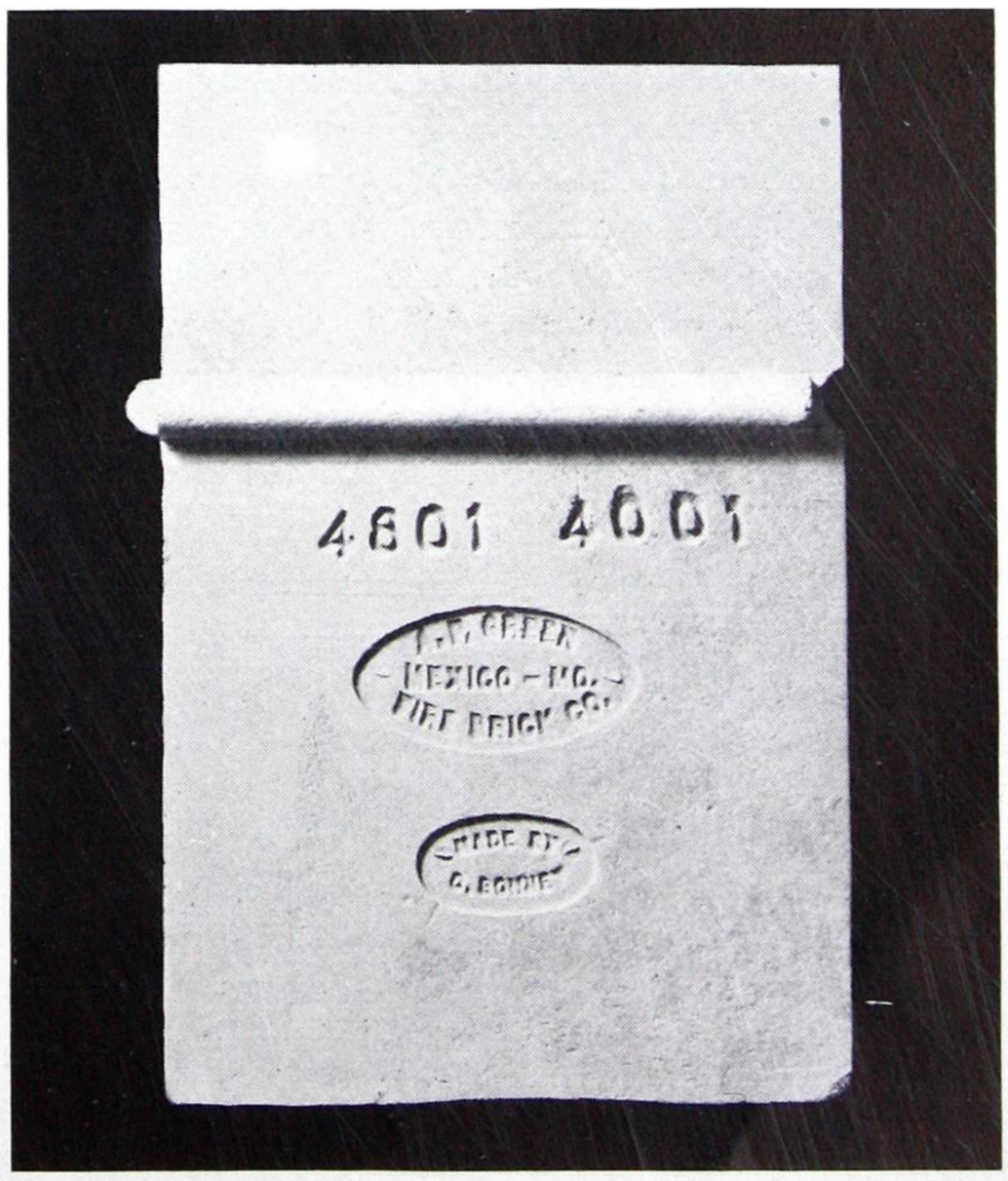


Close-up of molder hand bumping an Empire special shape. It's an expert's job — making uniform tile.

dates back to the old days of the Guilds, but it gives these men a feeling of responsibility for each piece of tile turned out and, as I said, a pride in workmanship that helps keep A. P. Green Hand-Made EMPIRES in such great demand.

These men are working with what is commonly known as "wood molds." Actually, most of them are steel lined. You won't find these steel-lined molds many other places, but we know that they resist wear and so they make more uniform shapes. If any considerable quantity of tile is to be made from a mold, we always

Craftsmanship at its highest level. All Special Shapes show the imprint of molder's names.



Here you see a molder placing a finished Empire tile on a monorail car which will carry it through the humidity dryer.

line it with steel—and solder in the screw heads to make the surface absolutely smooth. In other cases where the order calls for especially large tile, heavy steel molds are used and are "bumped" or tamped with an air hammer. While we are on the subject of molds I want to get this idea across. Making the mold is as important as making the shape itself. Accuracy in measurement is only one essential. The mold must be constructed so that when the tile is removed it will not spread or "squat." The mold must also be built solidly so that no bulge occurs which might bring about even a fractional change in dimension. In short, every mold, and we have more than 10,000 of them here, must be rugged and built to close tolerances in order that better shapes with truer sides and more perfect corners and edges may be turned out. To that end, we maintain a special mold-building shop manned by highly skilled cabinet and furniture makers, men thoroughly versed in the art of joining wood.

But to get back to the production of Hand-Made EMPIRES. We've seen intricate shapes made; we've seen men who by virtue of long years of experience and pride in their work are able to maintain the high standards of perfection set for them. Now we find the finished tile carefully checked for any cracks, laminations, or faults which may occur in the molding, being placed on overhead monorail cars where they will be allowed to temper for a few hours before going into the humidity dryers.

You remember a while back I talked a little about our humidity dryers. Now that we are back to that point again I want to explain the principle in detail. Years ago, before the advent of modern scientific humidity drying, these Hand-Made tile would have been placed on what was known as the "hot floor." Heat for this floor was supplied by steam coils underneath, and it was a terribly hot, humid place in which to work. The tile had to be turned by hand many times to insure adequate drying. Under this old-fashioned method, still used in many plants, uniform drying was impossible. Tile would bow up at the ends, were not true or uniform (see diagram on page 13) and were consequently more costly to produce and to use. Today, with our own type

Workmen shoving monorail car into the humidity dryer. The cars are mechanically conveyed through the dryer on schedules adapted to the drying requirements of each different shape.

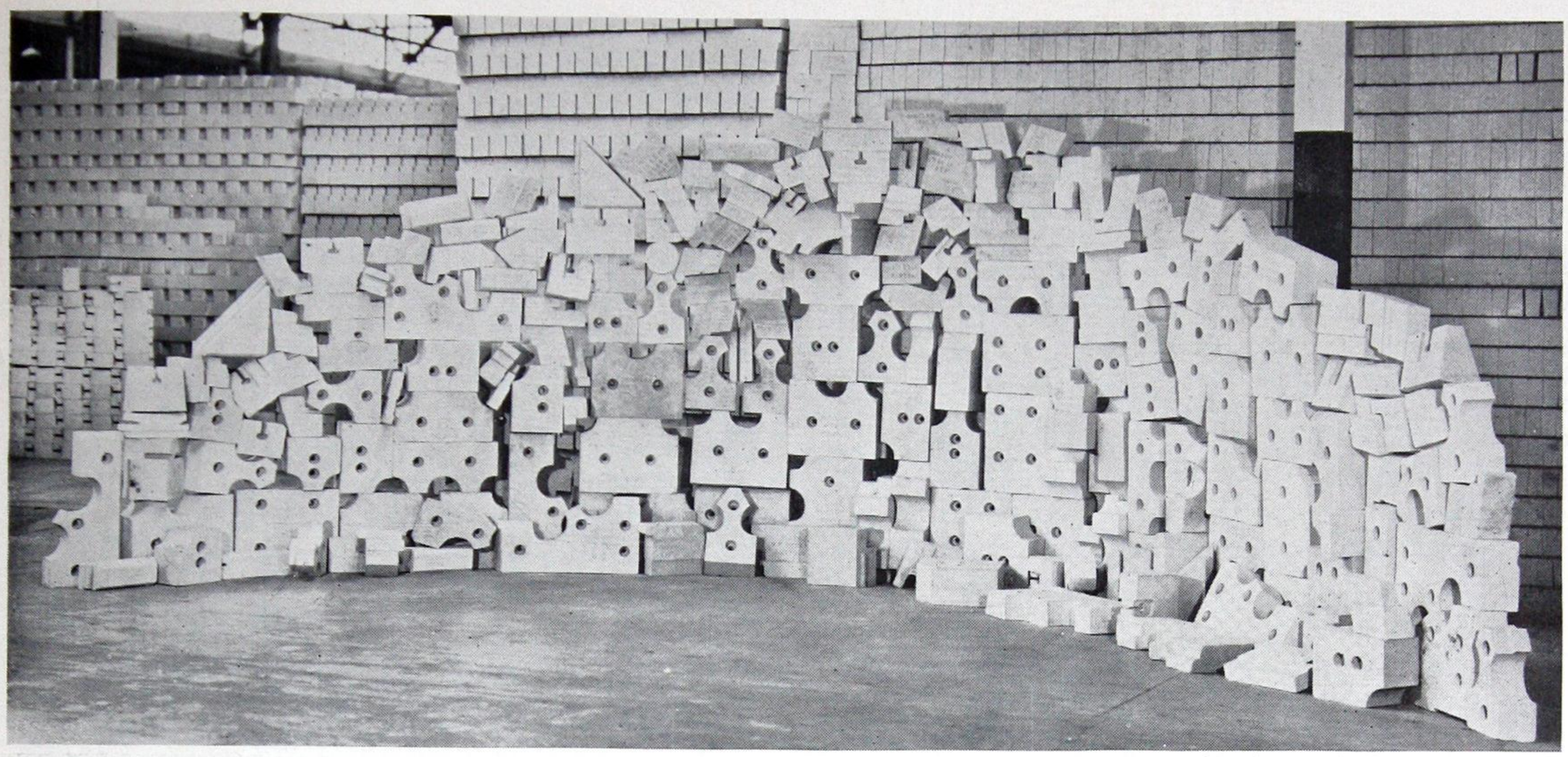
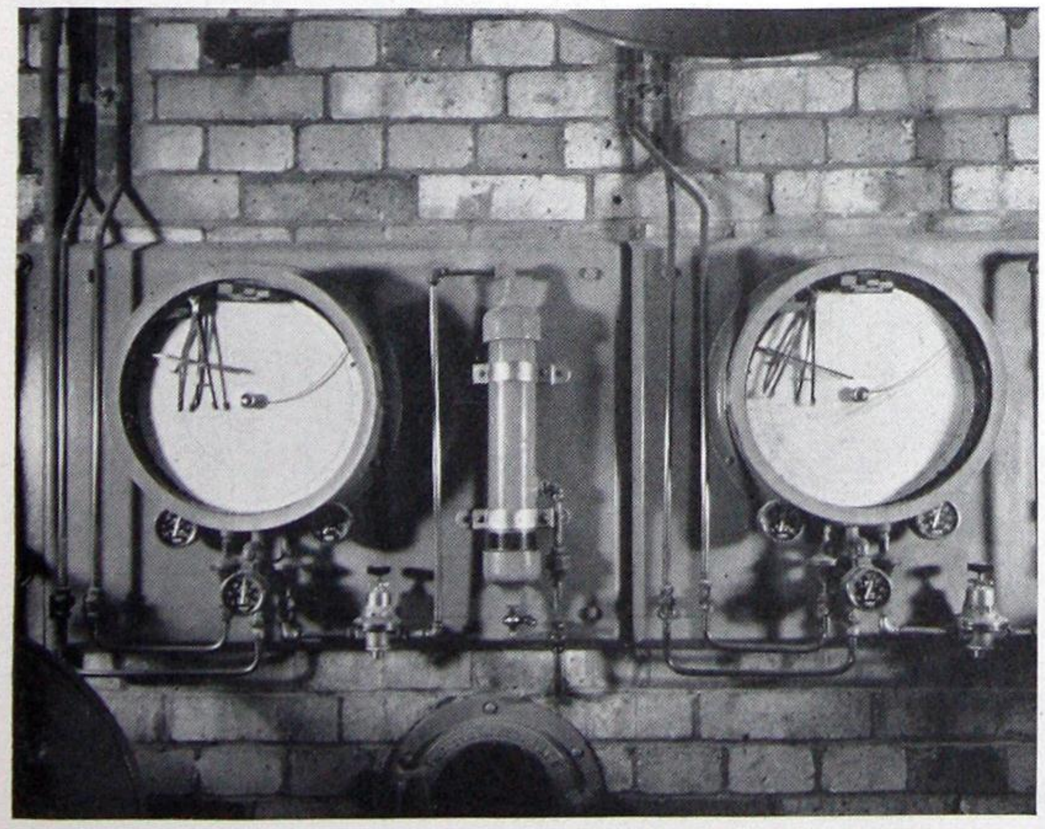


Photo showing various kinds of hand-made tile. This group represents one each of the shapes on a part of one order for A. P. Green Empire Special Shapes.

humidity dryers, absolute uniformity is possible because both humidity and temperature are controlled throughout the dryer. See those dials up there on the side of the dryer? Those are recording psychrometers and they are placed at six different points in three different compartments along the dryer. These instruments register accurately the relative humidity in each compartment and give us absolute control over the process.

As you will remember, we put the stiff mud and hand made shapes through the humidity dryers. The dry press brick, of course, had very little moisture to begin with. But none of these brick are yet dry enough for proper burning—so the cars are sent through a continuous tunnel type dryer which turns them out at the other end with only ½ of 1 per cent moisture.

Recording Psychrometers on one compartment of the humidity dryer insure absolute control of the relative humidity throughout the dryer.

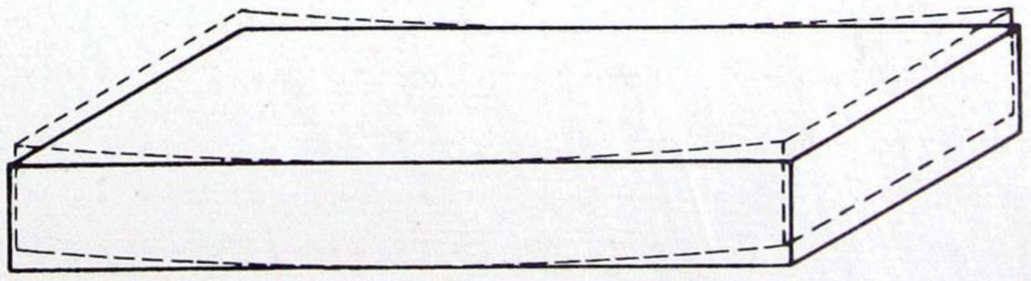


During this trip you've seen and followed through all three processes for making EMPIRES—Dry Press, Stiff Mud, and Hand-Made. You've seen the scores of improvements and refinements in manufacture. You've witnessed the unceasing vigilance and minute control exercised over the production of EMPIRES by plant supervisors, technicians and laboratory engineers, and we're not through yet.

We have finally brought all three types of EMPIRES to the burning point, so to speak, and if you don't mind a little heat we'll walk down here between these tunnel kilns. Tunnel kiln burning is rather an old story with us, we have used the method so long. As a matter of fact, we were among the first to introduce the modern method of tunnel kiln burning in this country. That was more than ten years ago. However, it may be new to you so I'll tell you something about its advantages.

To begin with, we have five tunnel kilns, one of them new — just recently built for burning super refractories. Here at the entrance end of the kiln you see a short vestibule where the loaded cars enter. Hydraulic pushers, motor and speed reducer operated, propel the cars. The pusher arm there is arranged to complete a stroke in slightly less than the time required between charges, so that the arm plunger has time to return and be in a

Diagram showing advantages of scientific humidity drying. Ordinary drying practices result in warped and "bellied" tile. Humidity dried Empire tile are true to dimensions.

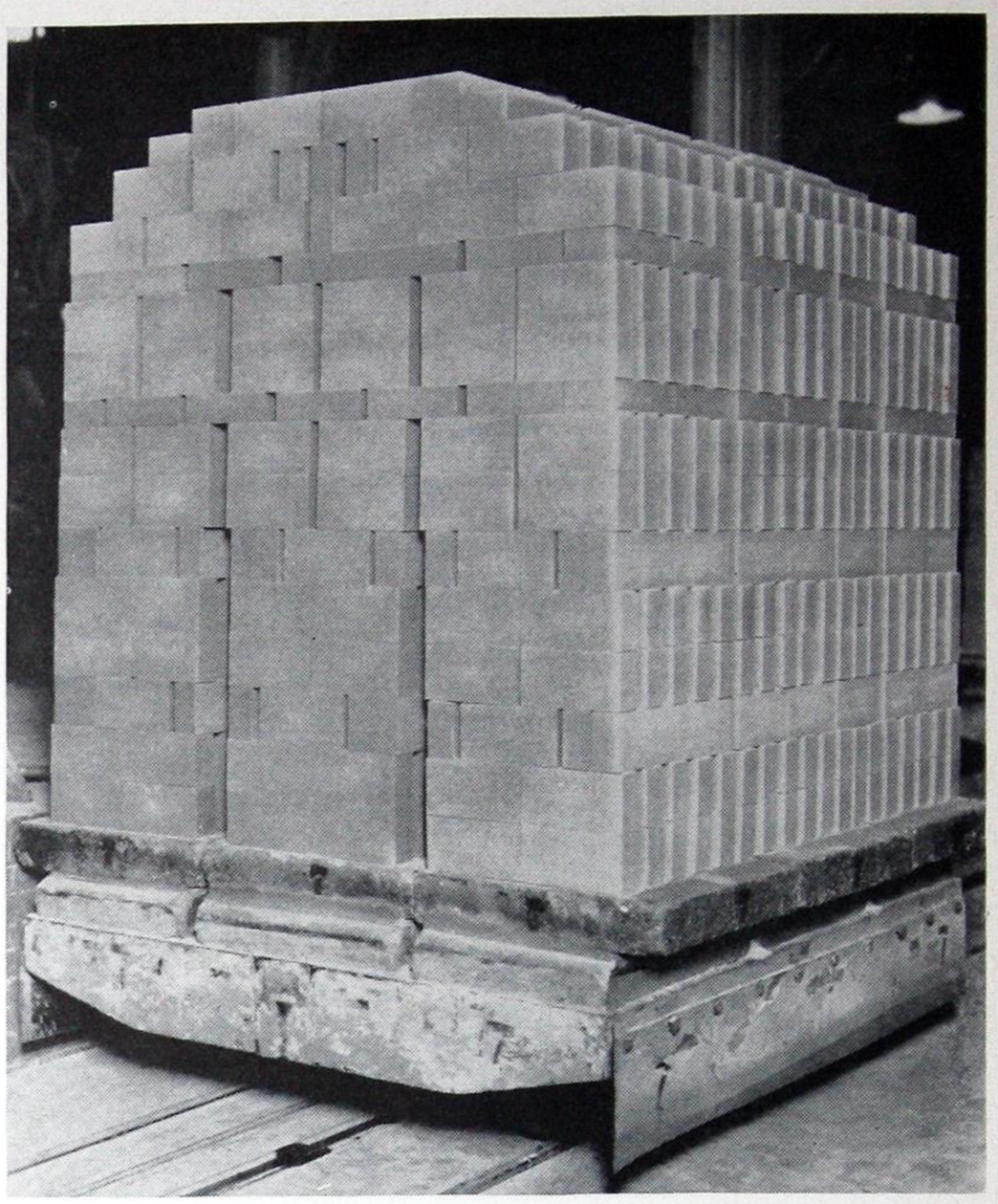


position to receive the next car. The train moves continuously through the kiln on a predetermined schedule. Here along the sides of the kiln you can see the inspection port-holes and down here in this terrific heat is the burning section. You see the cars advance slowly but steadily, coming into the burning zone gradually and leaving it just as gradually, to come out cool at the discharge end. Down here at this table below the instruments we see the burning schedules. Here the plant superintendent checks all temperature readings the entire length of the kiln as they are recorded from these indicating pyrometers. A careful hour-to-hour check is kept over every kiln, and the results from your standpoint are beautiful, perfectly burned brick and shapes, free from kiln marks and unnecessary flashing—free from warpage or pulling, the world's finest quality.

Here, after burning, another careful inspection is made to see that you get only perfect brick, and the inspection couldn't possibly be easier to make because here are the brick just as they were put on the car when they were made.

They haven't been touched, and you'll see in just a little bit that EMPIRES reach your plant exactly as they left here—perfect brick. I know that in the mind of every man who has any part in making these EMPIRES there is the hope that the user will treat them just as carefully on the job as we have.

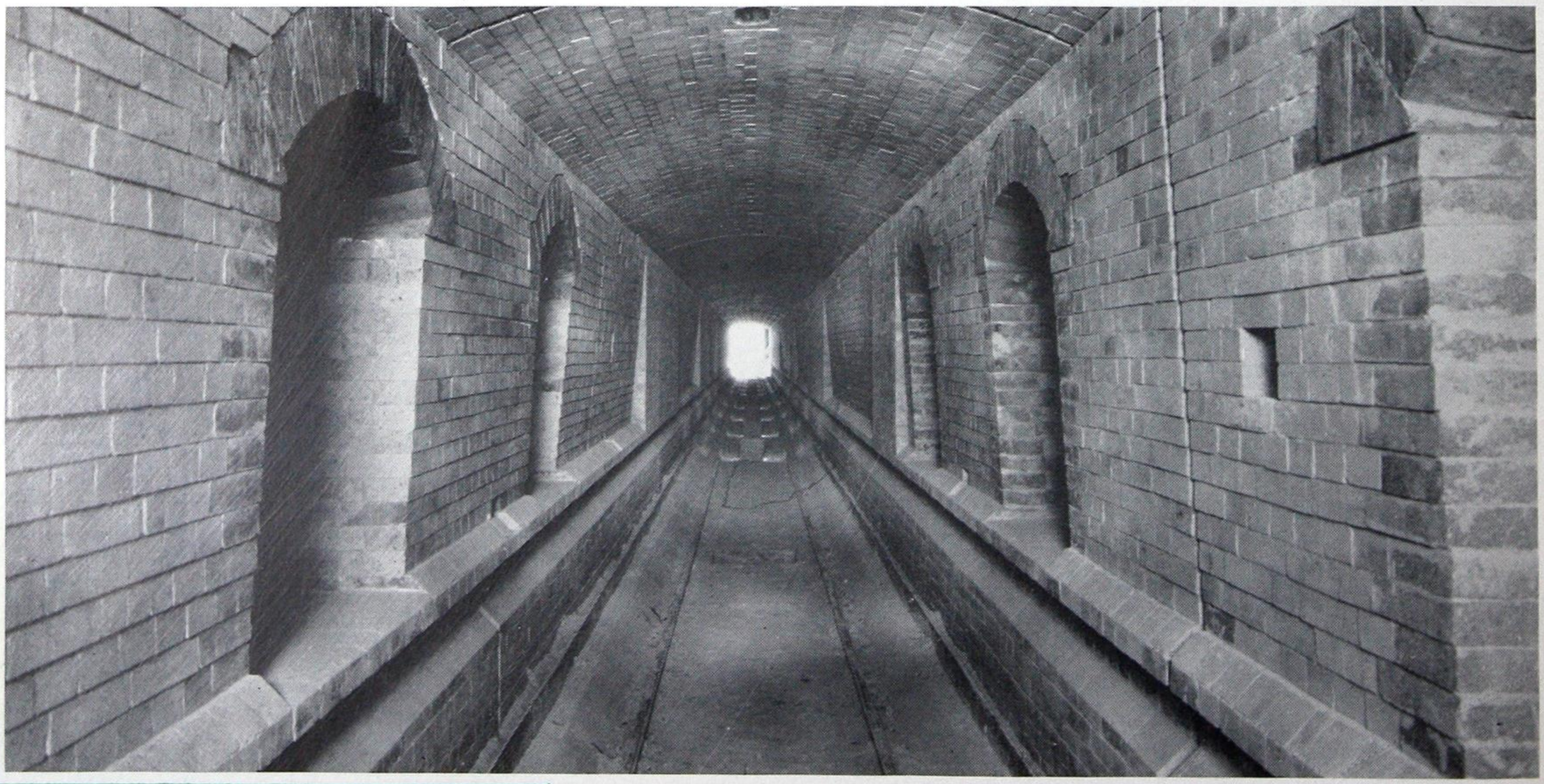
Out here we now see EMPIRES starting on their way into service. Take a look at one of these wheelbarrows on which the brick are being loaded. You can see that it's rubber-tired, has leaf springs and a ball-bearing wheel. Over there you can see the loader carefully placing rubber pads between the layers of brick to protect them, and out there ahead of you you can see the beautiful smooth concrete run-ways over which these brick roll



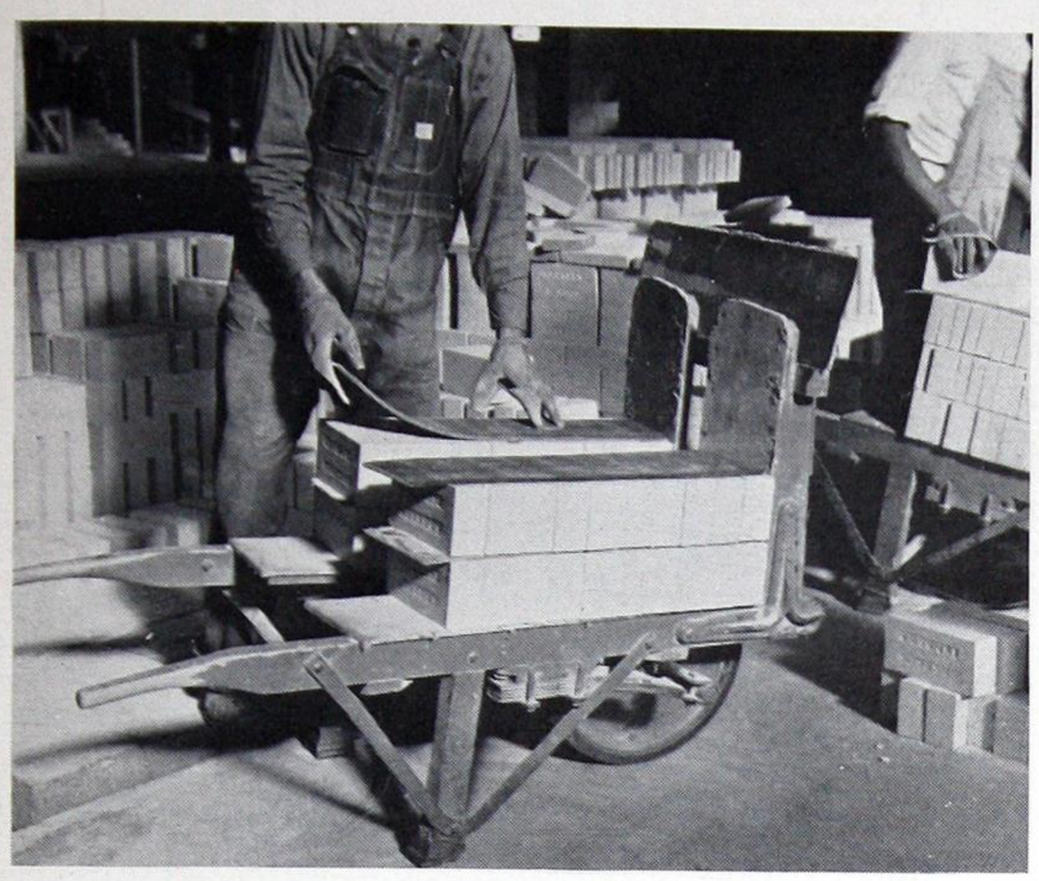
Carload of Empires leaving one of the tunnel kilns. Part of the million brick always on wheels in the A. P. Green plant.

to the cars, handled almost like rare china, and I know you can't help but get the feeling that with such lavish care, exacting scientific testing and checking, almost superhuman control, these EMPIRES are mighty fine brick. All through the plant today you've seen it, from the electric shovel man out at the pit to the

Interior view of the burner section of one of the modern A. P. Green tunnel kilns.



A. P. GREEN EMPIRE

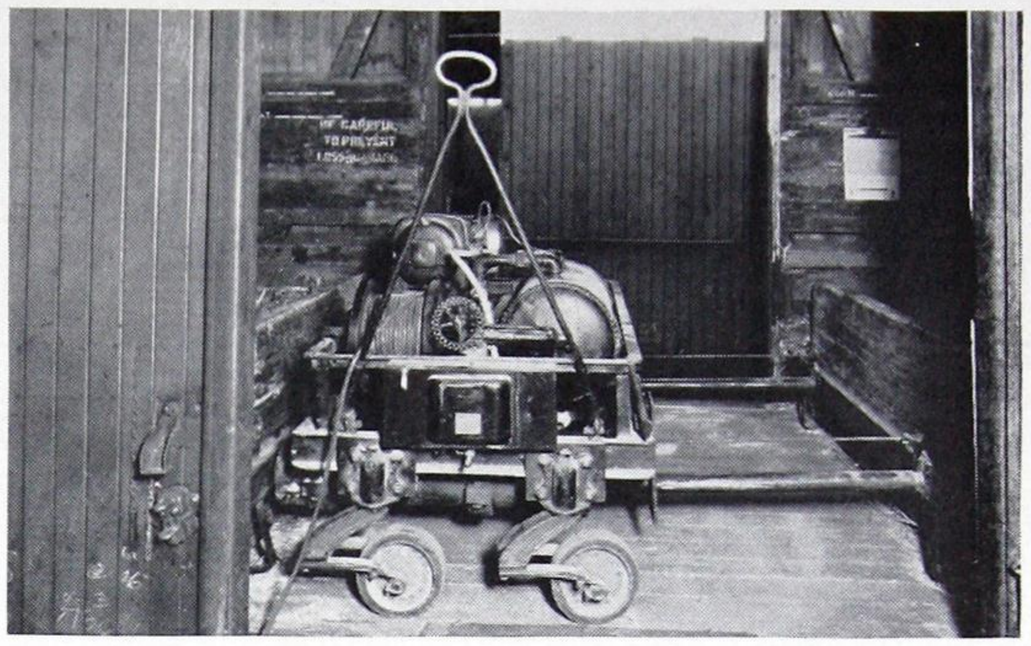


Workmen protecting Empire brick by placing rubber pads between the layers, in loading them on wheelbarrow.

boys who work with the brooms, keeping this brick plant spotlessly clean—pride of perfect production. Even here at the cars it goes on, and the men who load these brick feel that they must reach you flawless.

Loading brick in this plant is a mighty important job. A lot of study has gone into it, because getting the brick to a customer in perfect condition, whether he is in the next state, out on the Coast, or on another continent, is the culmination of all that we have put into their making. Different kinds of packing are used—straw, hay, excelsior, felt paper. Some loads are steel-bound, that is, the entire load in both ends of the car is bound; tightened, and fixed in place with steel strap bands. And here's a car where the load is being set with a hydraulic jack. If you'll look in there you can see both ends of the car have been loaded. Now the workmen fit a hydraulic compressor in the center of the car and with

Wheelers on the concrete dock loading Empire brick on barrows. These barrows are equipped with ball-bearing, rubber-tired wheels, and leaf-springs.

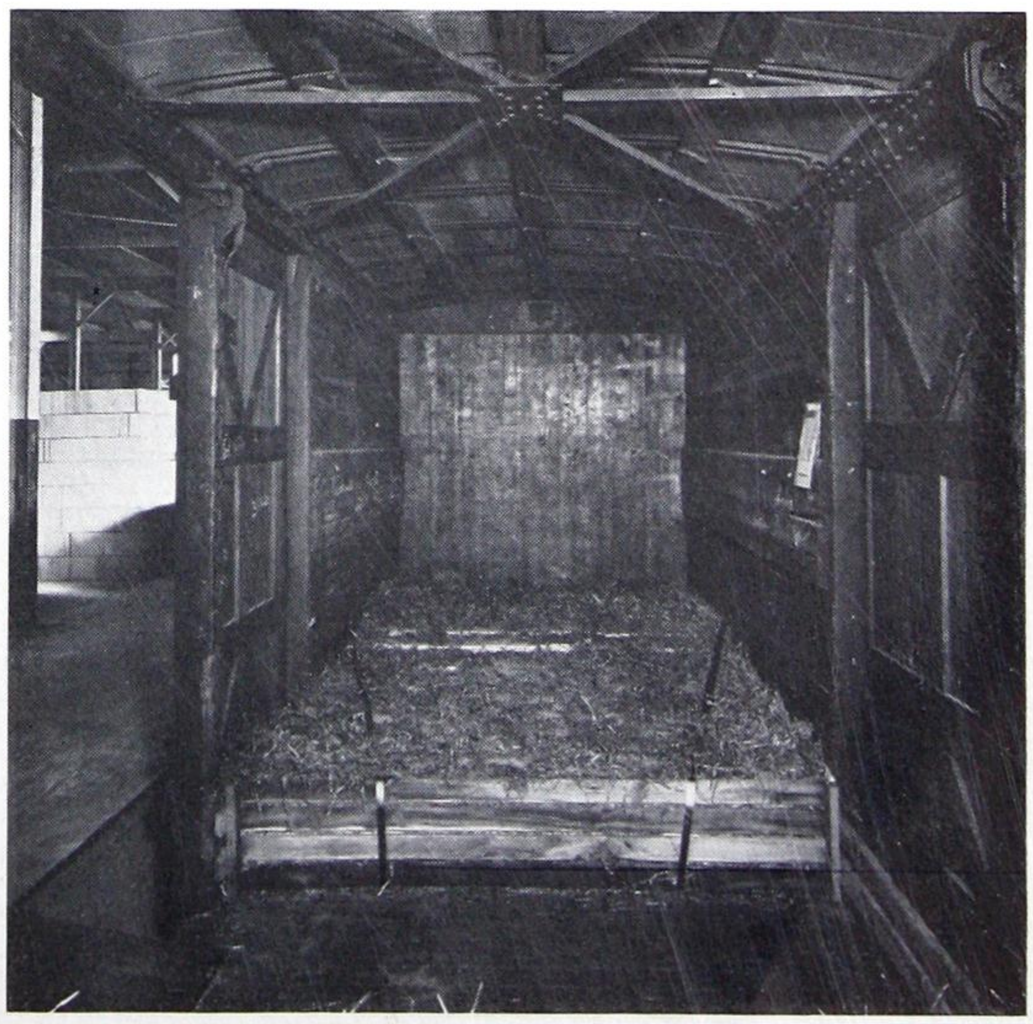


Hydraulic jack inside a car tightening the load of Empire brick at either end of the car. This is done so the brick will arrive at the job in perfect condition.

tons of even pressure force the brick toward both ends of the car. In this way the load is tightened and chipping and cracking in transit are prevented, so that the load arrives ready to live up to its famous name and reputation. Over here you can see the tremendous stocks of standard 9-inch shapes and hundreds of so-called "Special Shapes" which, because of demand, we stock just as though they were standard. In fact, with us, they are standard. Orders can be filled almost immediately, or special jobs pushed through with unusual speed.

And so, in this rather hurried trip, you've seen EMPIRES in the making, you've seen them made, you've seen them ready for delivery. To most people who see it for the first time, the A. P. Green plant and its highly modernized methods are an astonishing revelation. I hope it has been so to you and that you feel by now that we are justified in saying "EMPIRE, the World's Finest First Quality Fire Brick."

Photo of car of Empire bound with steel strap wire for safe transportation.



A. P. GREEN

EXPORT DEPT.

Export Packing and Shipping

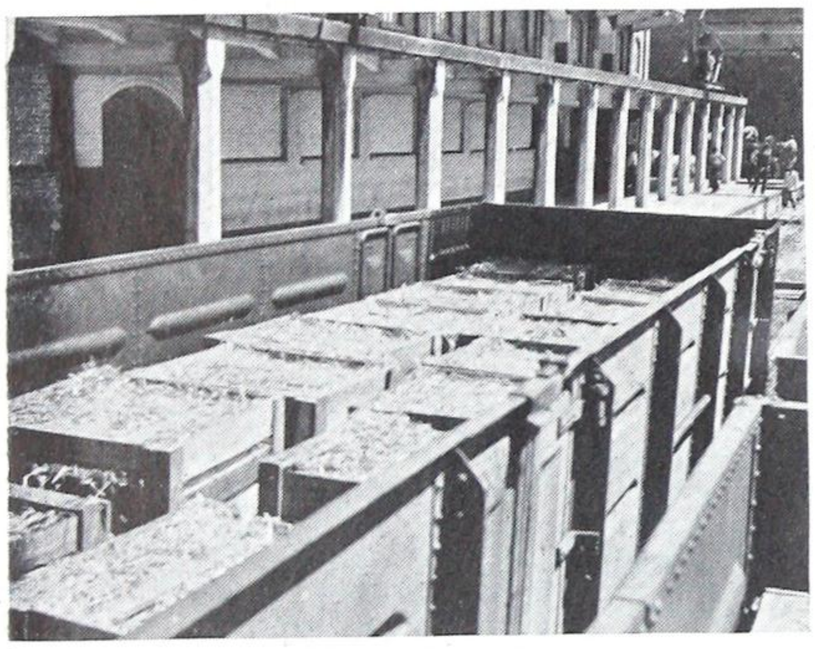
Fire Brick, and other refractory products exported, installed in the furnaces have high initial cost. Consequently, the product must be outstandingly better. It must last longer. It must arrive in good condition. Damaged corners or edges, broken fire brick, leaking drums and bursted sacks are an expensive inconvenience. Dependability upon the source of supply so far away is almost as important as the quality of the product and its proper selection. Our aim is to see that an order for A. P. Green refractories is shipped to arrive with the original factory quality preserved, and at the lowest packing and shipping cost consistently possible.

Export Department Cooperation

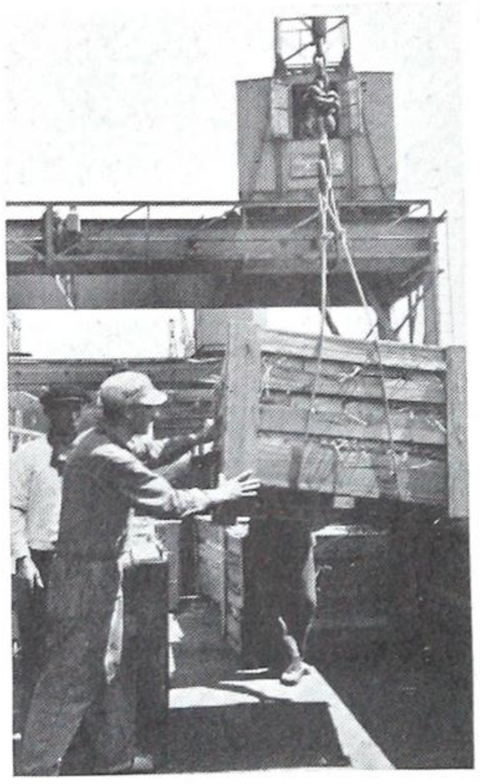
To manufacturers, furnace designers and builders in the United States who do not operate an export department, and even to those who do, is extended the invitation to avail themselves of the cooperation of our Export Department. Our Export Department will be very glad to consult with them, without obligation, concerning not only matters relating to the exportation of refractories but also the handling of any export problems on orders or inquiries which they may have.

View of part of stocks of A. P. Green's special skid-crates maintained at the port of New Orleans for those "must-make-sailing" orders. A shipment of a hundred thousand 9-inch bricks can be handled in A. P. Green's special skid-crates on a moment's notice. A million fire brick shipment can be just as readily cared for by our skid-crate building facilities at New Orleans.

A. P. Green's special skid-crates were developed to furnish A. P. Green's export trade with a low cost, safe fire brick packing. The success of this special shipping method has resulted in most A. P. Green export customers taking shipments in these special skid-crates.

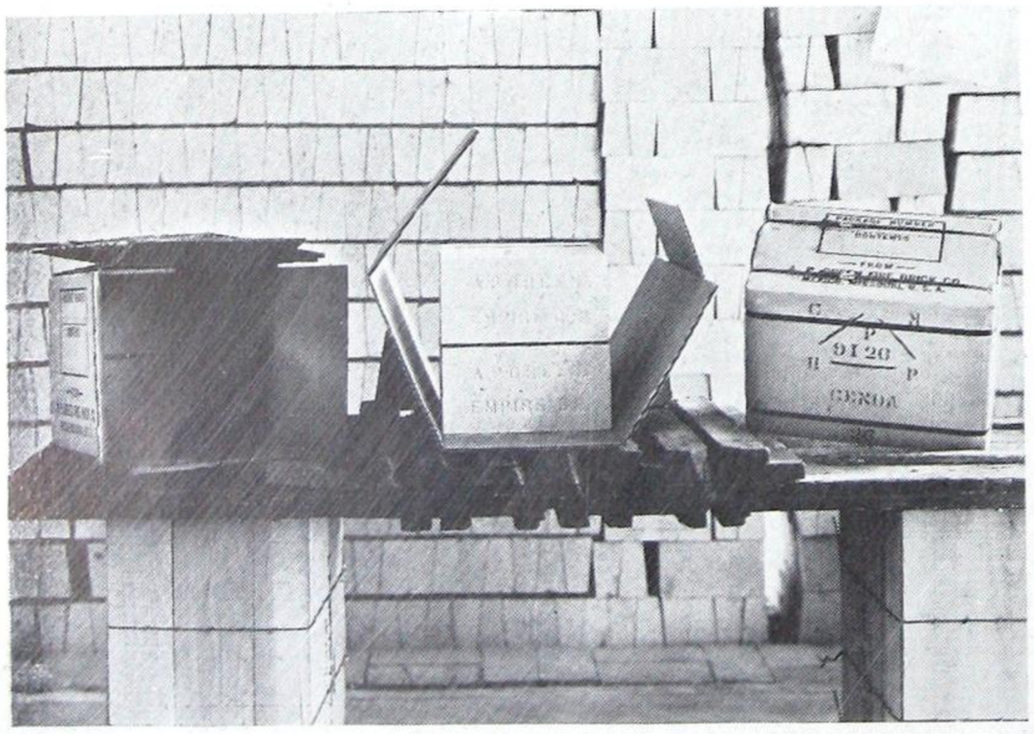


A. P. Green Special skid-crates filled with KRUZITE kiln liner blocks on foreign railway cars, ready to move many miles inland to a large cement plant. A. P. Green special skid-crates are the property of the A. P. Green customer, affording savings to the customer in handling and warehousing.



Unloading A. P. Green Refractories at Buenos Aires.

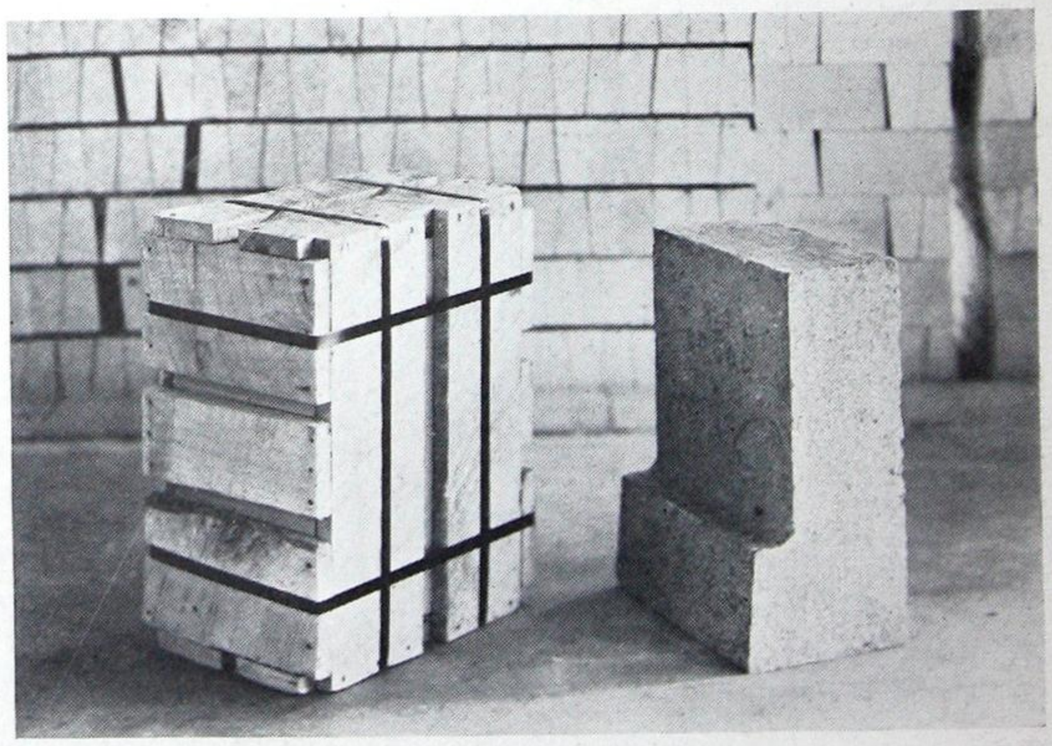
A. P. Green special skid-crates filled with A. P. Green Products, ready to go aboard ship.



A. P. Green Corrugated Strawboard, Steel-Strapped Cartons.

A. P. Green has exported millions of fire brick and shapes in corrugated strawboard cartons. This is a heavy-duty carton package, favored by some A. P. Green customers because of relative light weight and smaller number of brick to the package. Used in packing kiln liner blocks where individual package instead of A. P. Green skid-crate is desired by the customer.

Capacity of Carton—Ten 9″ straight brick, 9″ x 4½″ x 2½″ (22.86 x 11.43 x 6.35 cms.) or equivalent of other shapes.



Special A. P. Green Factory-Built Crates take the most intricate and expensive special shapes to the job in perfect condition.

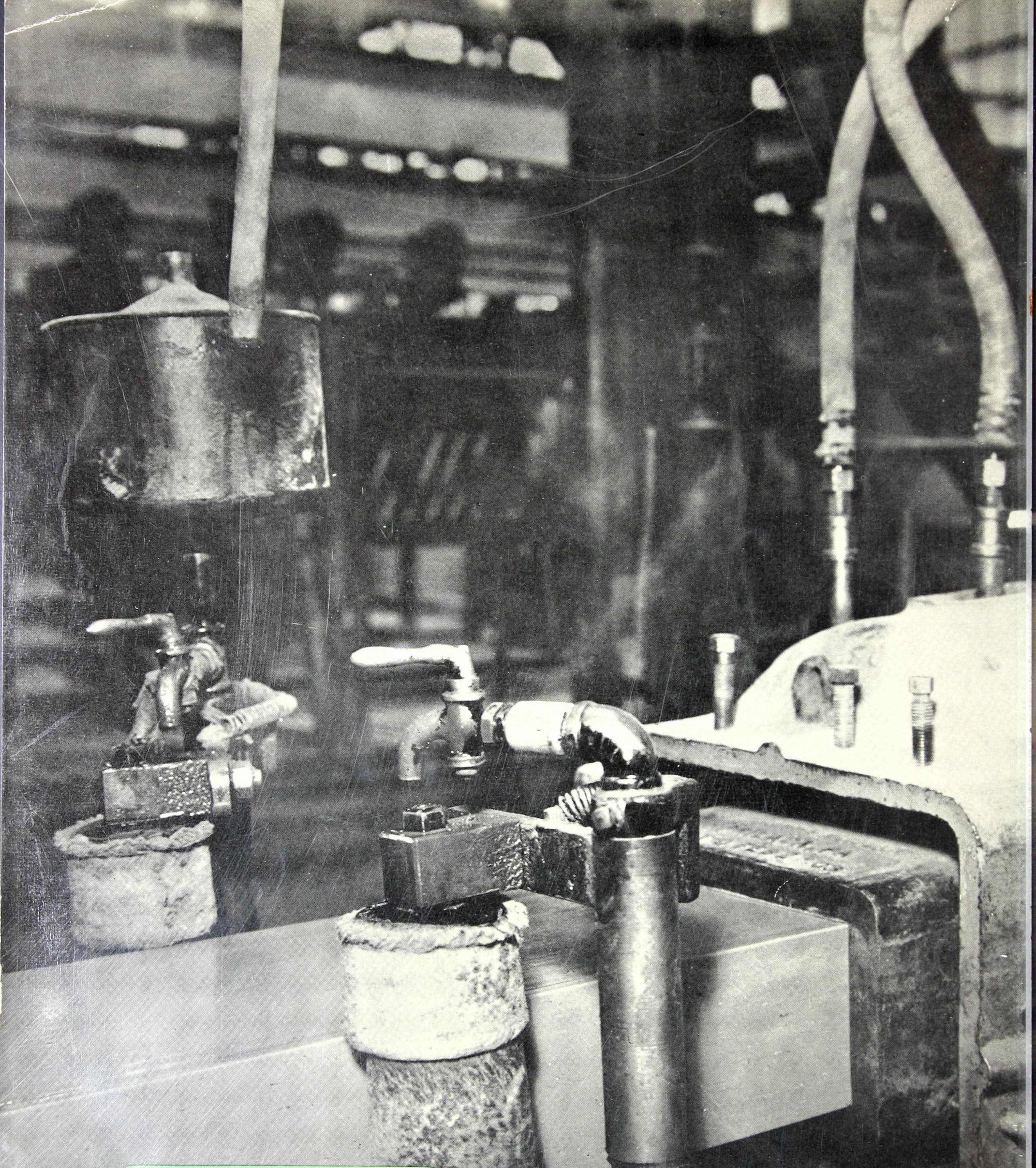
Note the construction of this package, built to fit the special shape; locked corners, steel strapping, interior bracing to prevent shifting; tough, thick but light-weight lumber to take up shock.

A. P. GREEN

EMPIRE

Printed in U. S. A.

A Corner of the Molding Floor
Where Hand-Made Empire Quality
Special Shapes are Produced.



Column of Clay Being Extruded from Augur Machine, for De-Aired Empire Stiff Mud Brick.